SOIL SURVEY OF

Vigo County, Indiana

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Purdue University Agricultural Experiment Station

Issued November 1974

Major fieldwork for this soil survey was done in the period 1968–70. Soil names and descriptions were approved in 1971. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1971. This survey was made cooperatively by the Soil Conservation Service and the Purdue University Agricultural Experiment Station. It is part of the technical assistance furnished to the Vigo County Soil and Water Conservation District. This survey was partially funded by Vigo County through the budget of the Vigo County Area Planning Commission.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Vigo County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It shows the page where each soil is described and gives the tree and shrub group in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units and the tree and shrub groups.

Foresters and others can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for trees and shrubs.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and recreation areas in the section "Town and Country Planning."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Vigo County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "General Nature of the County."

***Cover:* Area of a rolling Cincinnati silt loam in Vigo County.**

U.S. GOVERNMENT PRINTING OFFICE: 1974

**For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402**

Contents

Page
How this survey was made 1
General soil map 2
1. Genesee-Petrolia-Armiesburg association 2
2. Fincastle-Ragsdale association 3
3. Hennepin-Russell-Xenia association 4
4. Princeton-Ayrshire-Alford association 5
5. Elston-Warsaw-Rensselaer association 6
6. Iva-Cory association 7
7. Hickory-Cincinnati-Ava association 7
8. Reesville-Ragsdale association 9
Descriptions of the soils 10
Ade series 10
Alford series 12
Armiesburg series 13
Ava series 14
Ayrshire series 14
Bartle series 15
Bloomfield series 16
Borrow pits 17
Camden series 17
Cincinnati series 17
Cory series 19
Crane series 19
Eel series 20
Elston series 20
Fincastle series 22
Fox series 22
Genesee series 23
Genesee series, sandy variant 24
Gravel pits 24
Hennepin series 24
Hickory series 25
Iva series 25
Made land 26
Millsdale series 26
Muren series 27
Negley series 27
Parke series 28
Petrolia series 29
Princeton series 29
Proctor series 30
Ragsdale series 31
Randolph series 31
Reesville series 32
Rensselaer series 33
Rodman series 33
Page

Descriptions of the soils—Continued

Russell series 34
Shoals series 35
Sloan series 35
Strip mines 36
Tippecanoe series 37
Vincennes series 37
Wakeland series 38
Warsaw series 38
Washtenaw series 39
Westland series 40
Whitaker series 41
Xenia series 41
Zipp series 42
Use and management of the soils 43
Use of the soils for cropland 43
Capability grouping 43
Predicted yields 51
Woodland 52
Wildlife 53
Use of the soils for recreation 62
Engineering uses of the soils 62
Engineering classification systems 68
Engineering test data 68
Estimated engineering properties 69
Engineering interpretations 69
Town and country planning 100
Formation and classification of the soils 113
Factors of soil formation 113
Parent material 113
Climate 114
Plant and animal life 114
Relief 114
Time 115
Processes of soil formation 115
Classification of the soils 116
General nature of the county 117
History 117
Water supply 117
Relief and drainage 117
Climate 118
Industries, transportation, and markets 119
Farming 119
Literature cited 119
Glossary 119
Guide to mapping units Following 121

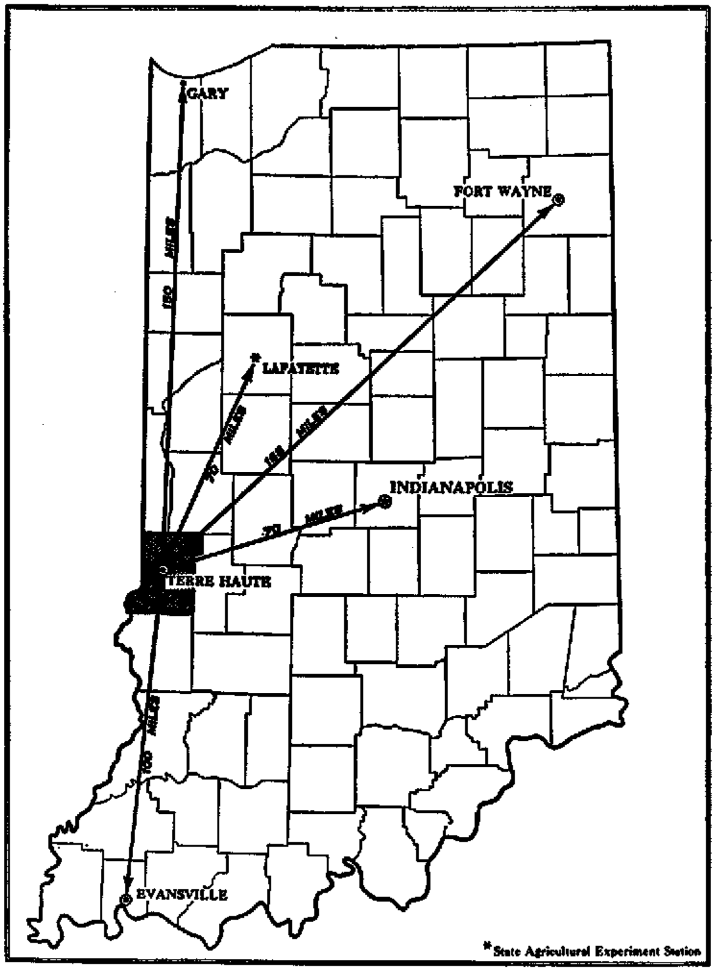
Issued November 1974

SOIL SURVEY OF VIGO COUNTY, INDIANA

BY ROBERT H. MONTGOMERY, SOIL CONSERVATION SERVICE

FIELDWORK BY ROBERT H. MONTGOMERY, ARTURO RIVERA, CARL W. GUERNSEY,
EARL E. VOSS, AND LEO A. KELLY, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH PURDUE
UNIVERSITY AGRICULTURAL EXPERIMENT STATION



*State Agricultural Experiment Station

Figure 1.—Location of Vigo County in Indiana.

VIGO COUNTY is in the extreme west-central part of Indiana (fig. 1). It has an area of 415 square miles, or 265,600 acres. Terre Haute, the county seat, is along the Wabash River in the central part of the county. In 1970 the population of the county was 114,528, and urban areas accounted for 80,908 of this.

Much of the county is on uplands and ranges from large, nearly level areas to very steep broken land. Many areas of the bottom lands, including those along the Wabash River, are subject to flooding. A large area of terrace, mainly along the bottom lands on the eastern side of the Wabash River, is nearly level and gently sloping. In many places steep escarpments separate the terrace from the adjacent bottom lands or uplands.

About two-thirds of the acreage is used for crops. Most of the rough broken land is used for woods or permanent pasture. Most of Harrison Township is built up and includes the city of Terre Haute. Cash-grain farming is the major farming enterprise in the county, but general farming is still important. Livestock and livestock products are the major sources of farm income on the general farms. It is estimated that approximately one-half of the cropland is managed and operated by part-time farmers.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Vigo County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey (*4*).[1]

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Cincinnati and Rensselaer, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

---

[1] Italic numbers in parentheses refer to Literature Cited p. 119.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Cincinnati silt loam, 6 to 12 percent slopes, eroded, is one of several phases within the Cincinnati series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Strip mines is a land type in this county.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants, and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or a high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil, and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Vigo County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field or for selecting the exact location of a road or a building or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

Soil asssociations and delineations on the general soil map in this survey do not fully agree with those of the general soil maps in adjacent counties published at a different date. Differences in the maps are the result of improvements in the classification of soils, particularly in the modifications or refinements in soils series concepts. In addition, more precise and detailed maps are needed because the uses of the general soil maps have expanded in recent years. The more modern maps meet this need. Still another difference is caused by the range in slope that is permitted within associations in different surveys.

The soil associations in Vigo County are discussed in the following pages.

The terms for texture used in the title of the associations apply to the texture of the surface layer. For example, in the title of association 3, the words, medium textured refer to the texture of the surface layer.

1. Genesee-Petrolia-Armiesburg association

Deep, well-drained and poorly drained, medium-textured and moderately fine textured, nearly level soils on bottom lands

This association consists of nearly level soils on bottom lands. It occupies about 16 percent of the county. Of this, about 21 percent is Genesee soils, 19 percent is Petrolia soils, 17 percent is Armiesburg soils, and 43 percent is minor soils (fig. 2).

The Genesee soils are on the flood plains along the Wabash River and other major streams. These are well-drained soils that formed in medium-textured alluvial material that feels gritty. They have a surface layer of dark grayish-brown silt loam and a subsoil of brown silt loam and dark yellowish-brown loam (fig. 3).

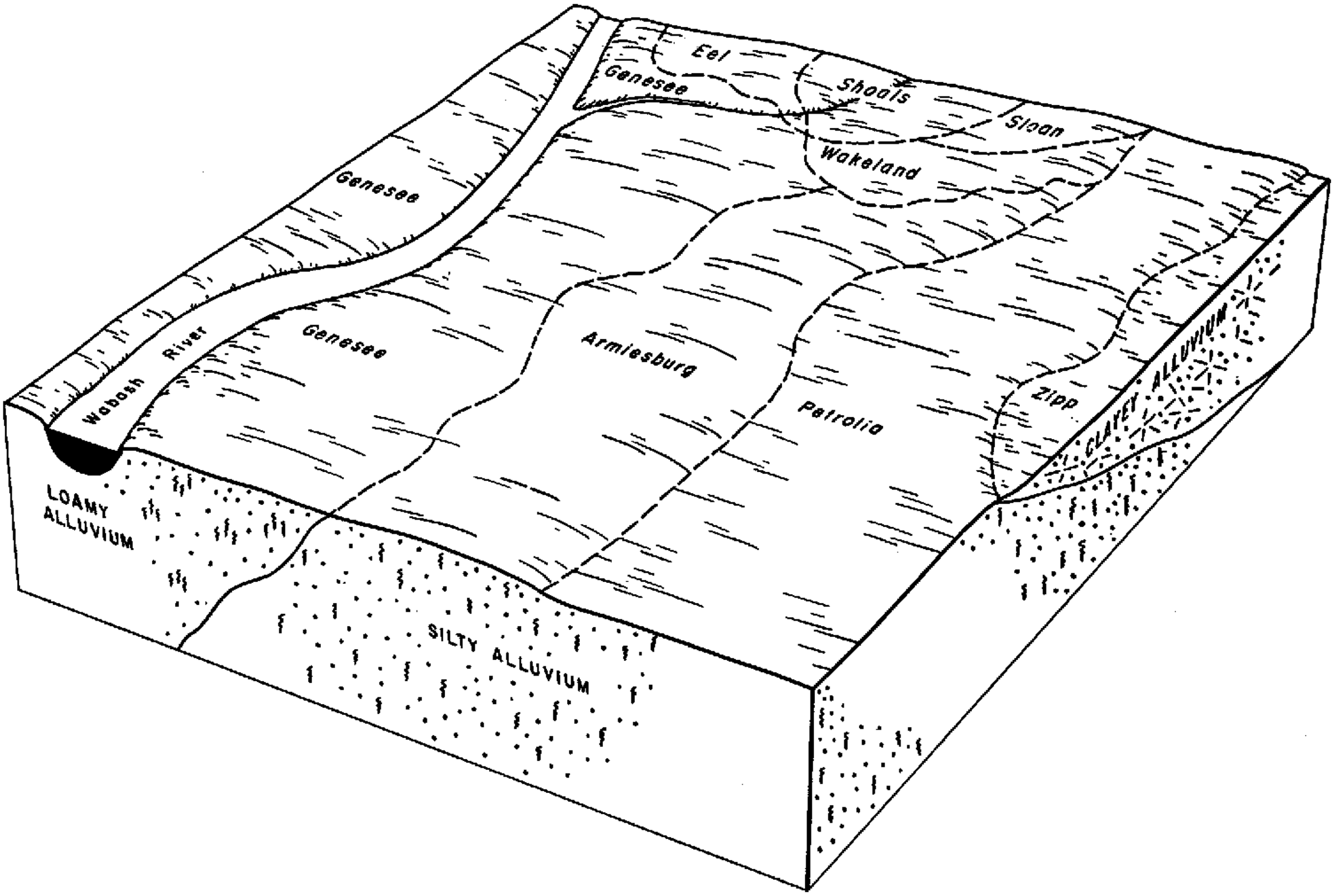


Figure 2.—Topography, soils, and underlying materials in association 1.

The Petrolia soils are on flood plains. These are poorly drained soils that formed in silty alluvial material. They have a surface layer of dark-gray silty clay loam and a subsoil of dark-gray silty clay loam that is mottled with yellowish brown.

The Armiesburg soils are on flood plains. These are well-drained soils that formed in predominantly silty alluvial deposits. They have a surface layer of a very dark grayish-brown silty clay loam and a subsoil of brown silt loam.

The minor soils in this association are in the Eel, Shoals, Sloan, Wakeland, and Zipp series. All of the minor soils formed in alluvial material on bottom lands. The moderately well drained Eel soils generally are farther away from the streams than the Genesee soils. Shoals and Wakeland soils are somewhat poorly drained. Both of these soils are commonly near the smaller streams. Sloan and Zipp soils are very poorly drained and generally are in slightly lower positions than the other soils in this association.

The soils in this association are used for crops, pasture, and woods. The main crops are corn, soybeans, grain sorghum, and meadow plants. Flooding is the main limitation to use and management. Some areas along the Wabash River are protected by levees, but during periods of high water in winter and early in spring, seepage through levees causes some flooding.

The major limitation of these soils for uses associated with town and country planning is the hazard of flooding.

2. *Fincastle-Ragsdale association*

Deep, somewhat poorly drained and very poorly drained, medium-textured and moderately fine textured, nearly level soils on uplands

This association consists of nearly level soils on uplands. It occupies about 3 percent of the county. Of this, about 40 percent is Fincastle soils, 38 percent is Ragsdale soils, and 22 percent is minor soils.

The Fincastle soils are somewhat poorly drained soils that formed in 2 to 3 feet of loess and the underlying glacial till. They have a surface layer of grayish-brown silt loam. The subsoil is yellowish-brown silty clay loam ranging to clay loam or loam with increasing depth. It is mottled with shades of gray and brown.

The Ragsdale soils are very poorly drained, nearly level to slightly depressional soils that formed in loess material. They have a surface layer of very dark gray silt loam ranging to black light silty clay loam. The subsoil is light silty clay loam. It is olive gray and

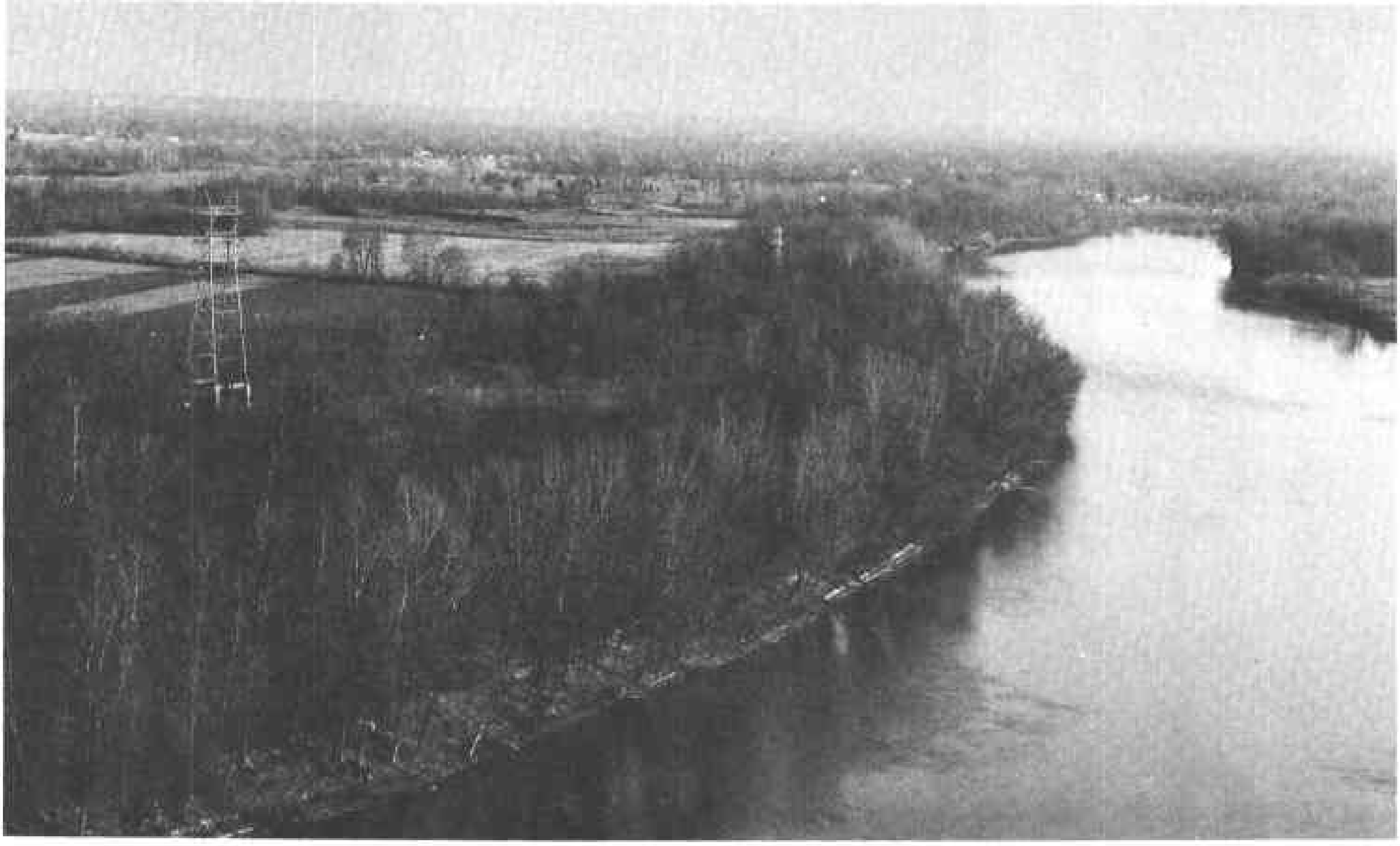


Figure 3.—**Genesee-Petrolia-Armiesburg association. Genesee soils are next to the river, Armiesburg soils adjoin them, and Petrolia soils are in the background.**

yellowish brown and is mottled with shades of olive and gray. The subsoil is underlain mainly by silt loam.

The minor soils in this association are in the Russell and Xenia series. The Russell soils are well drained and are gently sloping to strongly sloping on uplands. The Xenia soils are moderately well drained and are gently sloping on uplands.

The major soils in this association are suited to all crops commonly grown in the county if an adequate drainage system is established and maintained. Corn, soybeans, small grain, and meadow and pasture plants are the main crops. Wetness is the major limitation to use and management of the soils.

The major limitations of these soils for uses associated with town and country planning are wetness and slow permeability.

3. *Hennepin-Russell-Xenia association*

Deep, well drained and moderately well drained, medium-textured, strongly acid to neutral, gently sloping to very steep soils on uplands

This association consists of gently sloping to very steep soils on uplands. It occupies about 8 percent of the county. Of this, about 50 percent is Hennepin soils, 15 percent is Russell soils, 13 percent is Xenia soils, and 22 percent is minor soils.

The Hennepin soils formed in medium-textured glacial till. They are well-drained, very steep soils on the sides of ridges immediately below the tops. They have a surface layer of dark grayish-brown loam to silt loam that feels gritty and a subsoil of dark yellowish-brown light clay loam.

The Russell soils formed in about 2 to 3 feet of loess and the underlying glacial till. They are well-drained, gently sloping to strongly sloping soils on long, narrow ridges and short breaks adjacent to ridgetops. They have a surface layer of dark grayish-brown silt loam. The subsoil is yellowish-brown light silty clay loam in the upper part and clay loam in the lower part.

The Xenia soils formed in about 2 to 3 feet of loess and the underlying glacial till. They are moderately well drained, gently sloping soils along drainageways and short breaks adjacent to ridgetops. They have a surface layer of dark grayish-brown silt loam. The subsoil is yellowish-brown clay loam that is mottled with shades of gray in the lower part.

The minor soils in this association are in the Fincastle and Shoals series. The Fincastle are somewhat poorly drained, nearly level soils on uplands, and the Shoals are somewhat poorly drained, nearly level soils on bottom lands.

The Russell and Xenia soils are suited to crops, pasture, and woods. They are suited to corn, soybeans, small grain, and grassses and legumes. The Hennepin soils are better suited to woodland than to most other uses. Erosion is a hazard to the use and management of all of the major soils.

The major limitations of these soils for uses associated with town and country planning are the hazard of erosion and the moderately slow permeability of the gently sloping soils.

4. Princeton-Ayrshire-Alford association

Deep, well-drained and somewhat poorly drained, moderately coarse textured and medium-textured, nearly level to very steep soils on uplands

This soil association consists of nearly level to very steep soils on uplands. It occupies about 13 percent of the county. Of this, about 17 percent is Princeton soils, 12 percent is Ayrshire soils, 11 percent is Alford soils, and 60 percent is minor soils (fig. 4).

The Princeton soils formed in windblown fine sand and minor amounts of silt. They are well-drained, gently sloping to moderately steep soils on dune-shaped ridges and knolls. The surface layer is brown fine sandy loam, and the subsoil is brown sandy clay loam in the upper part and yellowish-red sandy loam in the lower part.

The Ayrshire soils formed in stratified, loamy, windblown materials. They are somewhat poorly drained, nearly level soils on uplands and terraces. The surface layer is grayish-brown fine sandy loam. The subsoil is mottled with yellowish brown and gray. It ranges from find sandy loam in the upper and lower parts to heavy sandy clay loam in the middle part.

Alford soils formed in more than 5 feet of loess. They are well-drained, gently sloping to very steep soils on narrow ridgetops and on side slopes immediately below ridges. The surface layer is brown silt loam, and the subsoil is brown heavy silt loam and silty clay loam.

The minor soils in the association are in the Bloomfield, Hickory, Iva, Reesville, Rensselaer, Shoals, and Wakeland series. The Bloomfield are somewhat excessively drained, gently sloping to strongly sloping soils on uplands, and the Hickory are well-drained, steep and very steep soils on uplands. The Iva and Reesville are somewhat poorly drained, nearly level soils on uplands. The Rensselaer are very poorly drained, nearly level to slightly depressional soils on uplands, and the Shoals and Wakeland are somewhat poorly drained, nearly level soils on bottom lands.

The Princeton and Alford soils that have the more gentle slopes are suited to crops, those that have steep slopes are suited to pasture plants or trees, and those that have very steep slopes are suited to trees. Ayrshire soils are suited to corn, soybeans, small grain, and meadow and pasture plants if a suitable drainage system is estab-

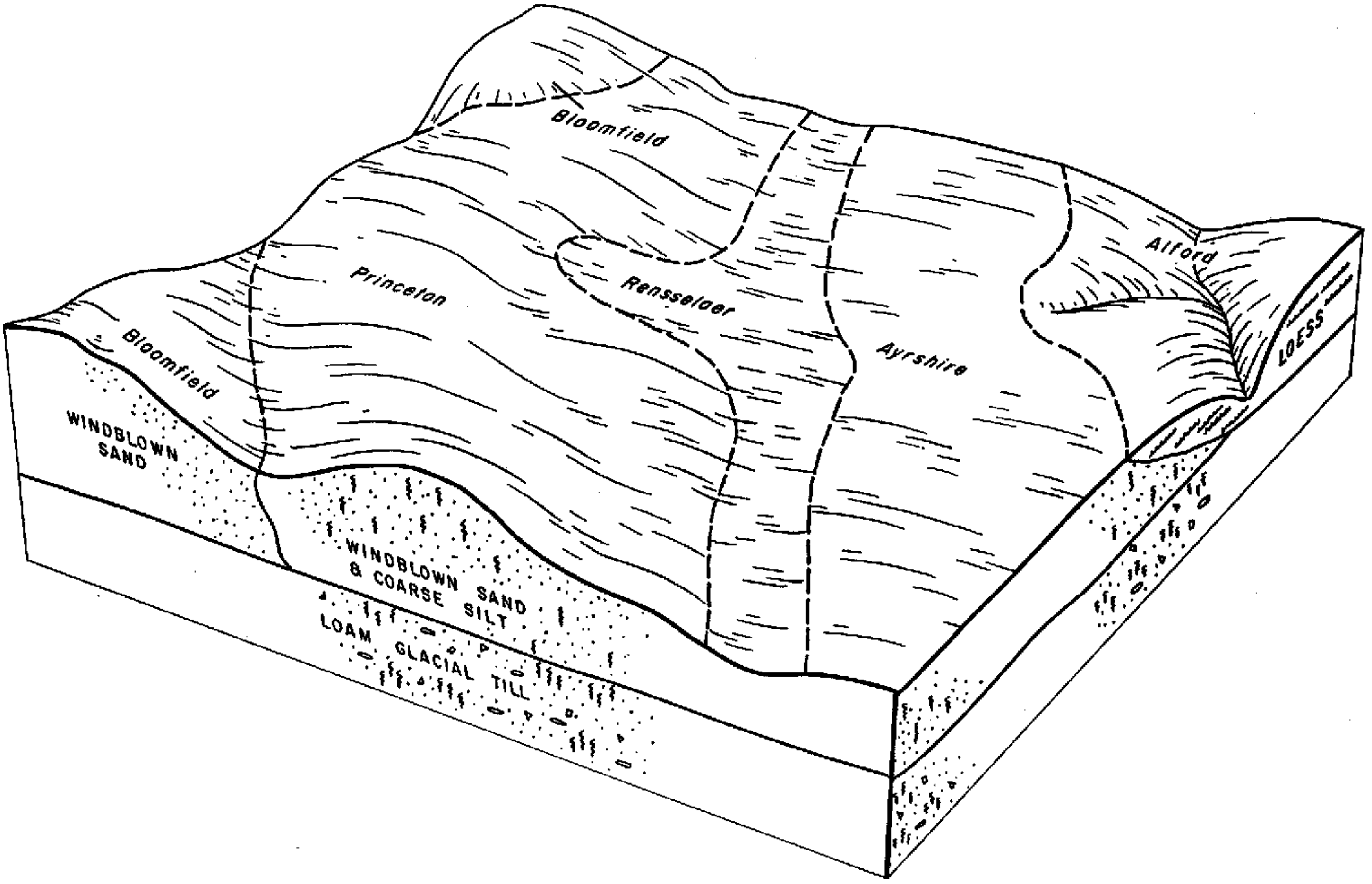


Figure 4.—Topography, soils, and underlying materials in association 4.

lished and maintained. Erosion is a hazard to the use and management of the Alford and Princeton soils, and wetness is the major limitation of the Ayrshire soils.

For uses associated with town and country planning, slope is the major limitation of the Alford and Princeton soils and wetness is the major limitation of the Ayrshire soils.

5. *Elston-Warsaw-Rensselaer association*

Deep, well-drained and very poorly drained, moderately coarse textured, medium-textured, and moderately fine textured, nearly level to gently sloping soils on terraces

This association consists of nearly level to gently sloping soils on terraces. It occupies about 20 percent of the county. Of this, about 35 percent is Elston soils, 16 percent is Warsaw soils, 8 percent is Rensselaer soils, and 41 percent is minor soils (fig. 5).

The Elston soils are well drained and formed in sandy glacial outwash. Their surface layer is very dark brown sandy loam. The subsoil is dark-brown sandy loam in the upper part and ranges to loamy sand and loose sand in the lower part. Some areas are underlain by calcareous, stratified sand and gravel below a depth of 5 to 6 feet.

The Warsaw soils are well drained and formed in loamy glacial outwash and the underlying calcareous sand and gravel. Their surface layer is black sandy loam. The subsoil is dark-brown clay loam in the upper part and gravelly sandy clay loam in the lower part.

The Rensselaer soils are very poorly drained and nearly level to slightly depressional. These soils formed in loamy lake-laid material. The surface layer is very dark gray loam or silty clay loam. The subsoil is dark gray and is mottled with yellowish brown and brown. It is sandy loam in the upper part and clay loam in the middle part; it ranges to sandy clay loam and sandy loam as depth increases.

The minor soils in this association are in the Ade, Camden, Crane, Proctor, and Whitaker series. The Ade are somewhat excessively drained, gently sloping to moderately sloping soils on dunelike terraces and uplands. The Camden and Proctor are well-drained soils on terraces. The Camden soils are nearly level to gently sloping, and the Proctor soils are nearly level. The Crane and Whitaker are nearly level, somewhat poorly drained soils on terraces.

The soils in this association are suited to corn, soybeans, small grain, and meadow plants. The main concerns of management are the medium to low available water capacity of the Elston and Warsaw soils and the need for drainage on the very poorly drained Rensselaer soils.

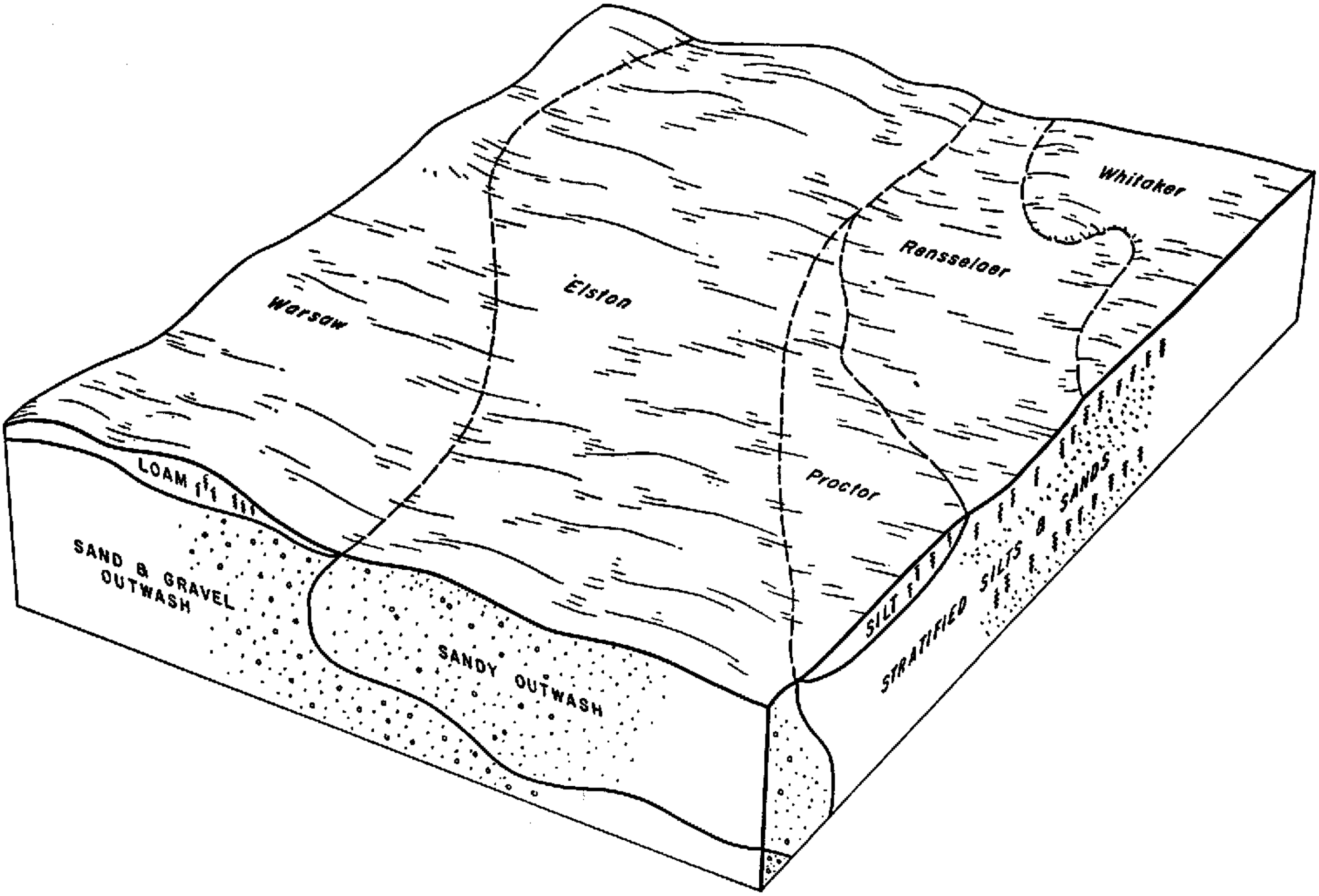


***Figure 5.*—Topography, soils, and underlying materials in association 5.**

Deposits of sand and gravel underlie many areas of the soils in this association. Some of these deposits are used commercially as a source of sand or gravel. Presently, more than 1,000 acres are used for this purpose.

The major limitation for uses associated with town and country planning is the wetness of the very poorly drained Rensselaer soils.

6. *Iva-Cory association*

Deep, somewhat poorly drained, medium-textured, nearly level to gently sloping soils on uplands

This association consists of nearly level to gently sloping soils on uplands. It occupies about 16 percent of the county. Of this, about 60 percent is Iva soils, 22 percent is Cory soils, and 18 percent is minor soils (fig. 6).

The Iva soils are somewhat poorly drained and are nearly level to gently sloping. They formed in more than 6 feet of loess. The surface layer is grayish-brown silt loam. The subsoil is mottled dark grayish-brown and yellowish-brown light silty clay loam that grades to heavy silt loam in the lower part.

The Cory soils are somewhat poorly drained and nearly level. They formed in more than 6 feet of loess. The surface layer is very dark grayish-brown silt loam. The subsoil is mottled light brownish-gray and yellowish-brown heavy silt loam that grades to silty clay loam and is underlain by heavy silt loam or light clay loam.

The minor soils in this association are in the Ava, Cincinnati, and Muren series. The Ava and Muren soils are moderately well drained. The Ava soils are gently sloping, and the Muren soils are nearly level to gently sloping on uplands. The Cincinnati are well-drained, moderately sloping to strongly sloping soils on uplands.

The major soils in this association are suited to corn, soybeans, small grain, and meadow and pasture plants if a suitable drainage system is established and maintained. More than 4,000 acres of this association has been strip mined for coal. The main concerns of management are improvement of drainage and maintaining good tilth.

The major limitations of these soils for uses associated with town and country planning are the seasonal high water table and the slow permeability.

7. *Hickory-Cincinnati-Ava association*

Deep, well drained and moderately well drained, medium-textured, very strongly acid and strongly acid, gently sloping to very steep soils on uplands

This association consists of gently sloping to very steep soils on uplands. It occupies about 17 percent of the

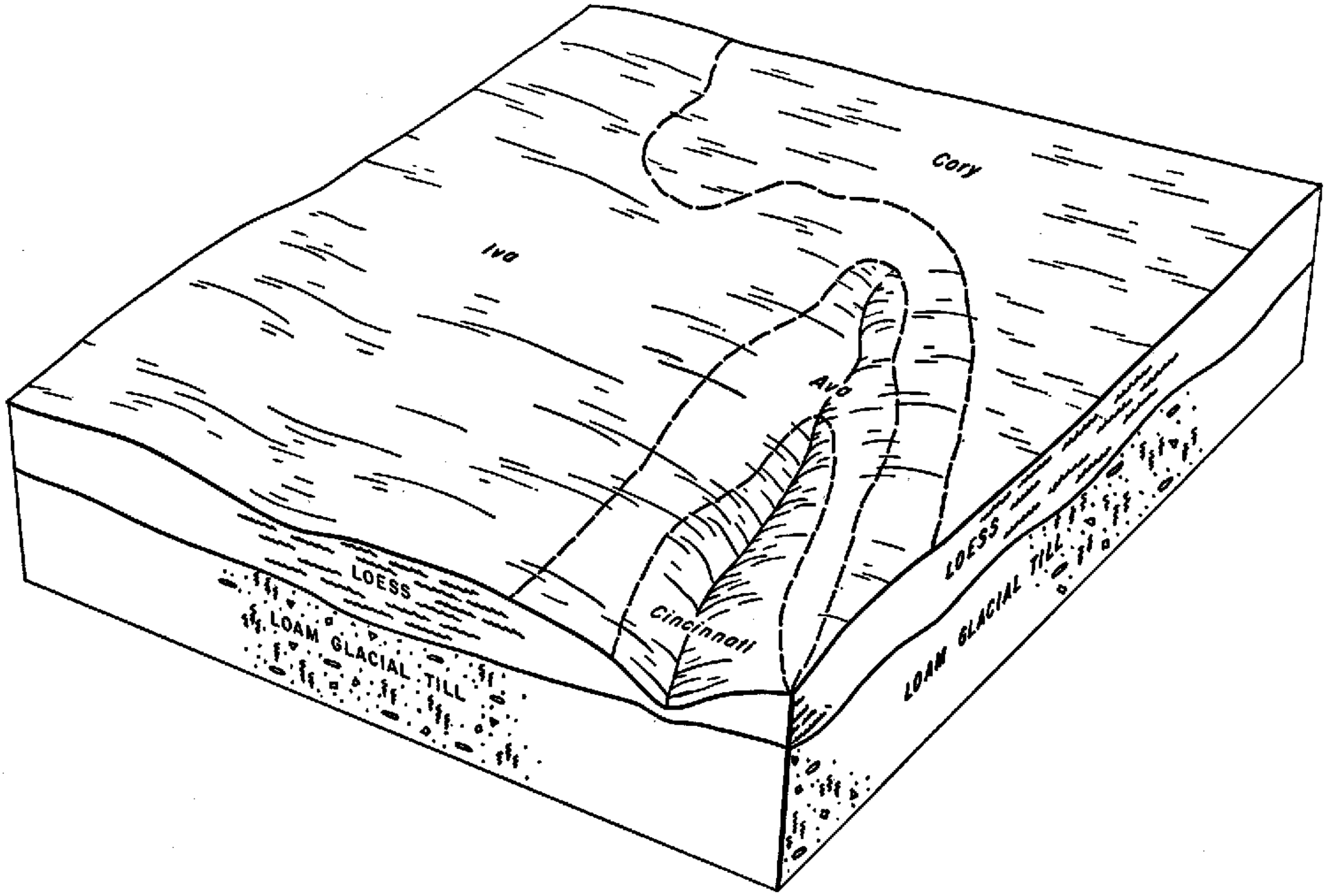


***Figure 6.*—Topography, soils, and underlying materials in association 6.**

county. Of this, about 46 percent is Hickory soils, 12 percent is Cincinnati soils, 7 percent is Ava soils, and 35 percent is minor soils (fig. 7).

The Hickory soils are well-drained, moderately steep to very steep soils along natural drainageways and escarpments. They formed in 0 to 18 inches of loess and in material weathered from glacial till. The surface layer is dark grayish-brown loam. The subsoil is yellowish-brown loam that grades to sandy clay loam in the upper part and clay loam that grades to loam in the lower part.

The Cincinnati soils are well-drained, moderately sloping to strongly sloping soils on long, narrow ridges and short breaks below ridgetops. They formed in about 2 to 4 feet of loess and in material weathered from glacial till. They have a very firm, brittle fragipan at a depth of about 2½ feet. The surface layer is dark-grayish brown silt loam. The subsoil is yellowish-brown light silty clay loam above the fragipan and becomes mottled with shades of gray at the fragipan. The texture grades to clay loam in the lower part of the fragipan and the lower part of the subsoil.

The Ava soils are moderately well drained, gently sloping soils on ridgetops and along drainageways. They formed in 2 to 4 feet of loess and in the underlying glacial till. They have a very firm, brittle fragipan at a depth of about 2½ feet. The surface layer is dark grayish-brown silt loam. The upper part of the subsoil is yellowish-brown light silty clay loam or heavy silt loam that is mottled with shades of gray above the fragipan. The lower part of the subsoil grades to a light clay loam.

The minor soils in this association are in the Alford, Iva, Shoals, and Wakeland series. The Alford are well-drained, gently sloping to very steep soils on uplands. The Iva are somewhat poorly drained, nearly level to gently sloping soils on uplands. The Shoals and Wakeland are somewhat poorly drained, neary level soils on bottom lands.

The Hickory soils are too steep for cultivated crops but are suited to trees. The Ava and Cincinnati soils are suited to most crops commonly grown in the county. Corn, soybeans, small grain, and meadow and pasture plants are the main crops. The main concerns of management are controlling erosion on all of the major soils and the moderate available water capacity caused by the fragipan in the Ava and Cincinnati soils. The major soils are well suited to the construction of farm ponds or lakes. This is because of the rolling to steep topography and the slow permeability of the underlying till material (fig. 8). More than 2,000 acres of this association have been strip mined for coal.

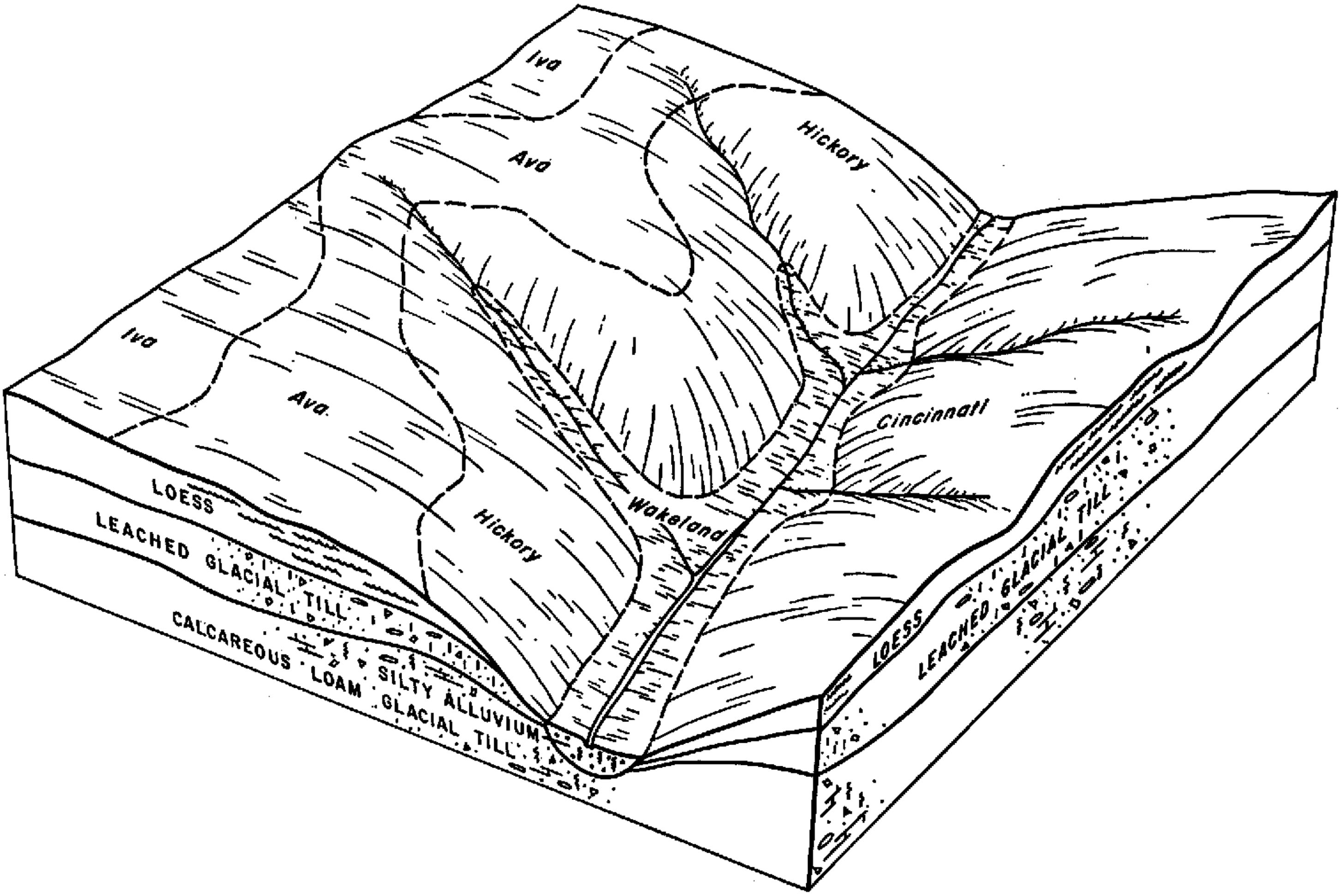


Figure 7.—Topography, soils, and underlying materials in association 7.

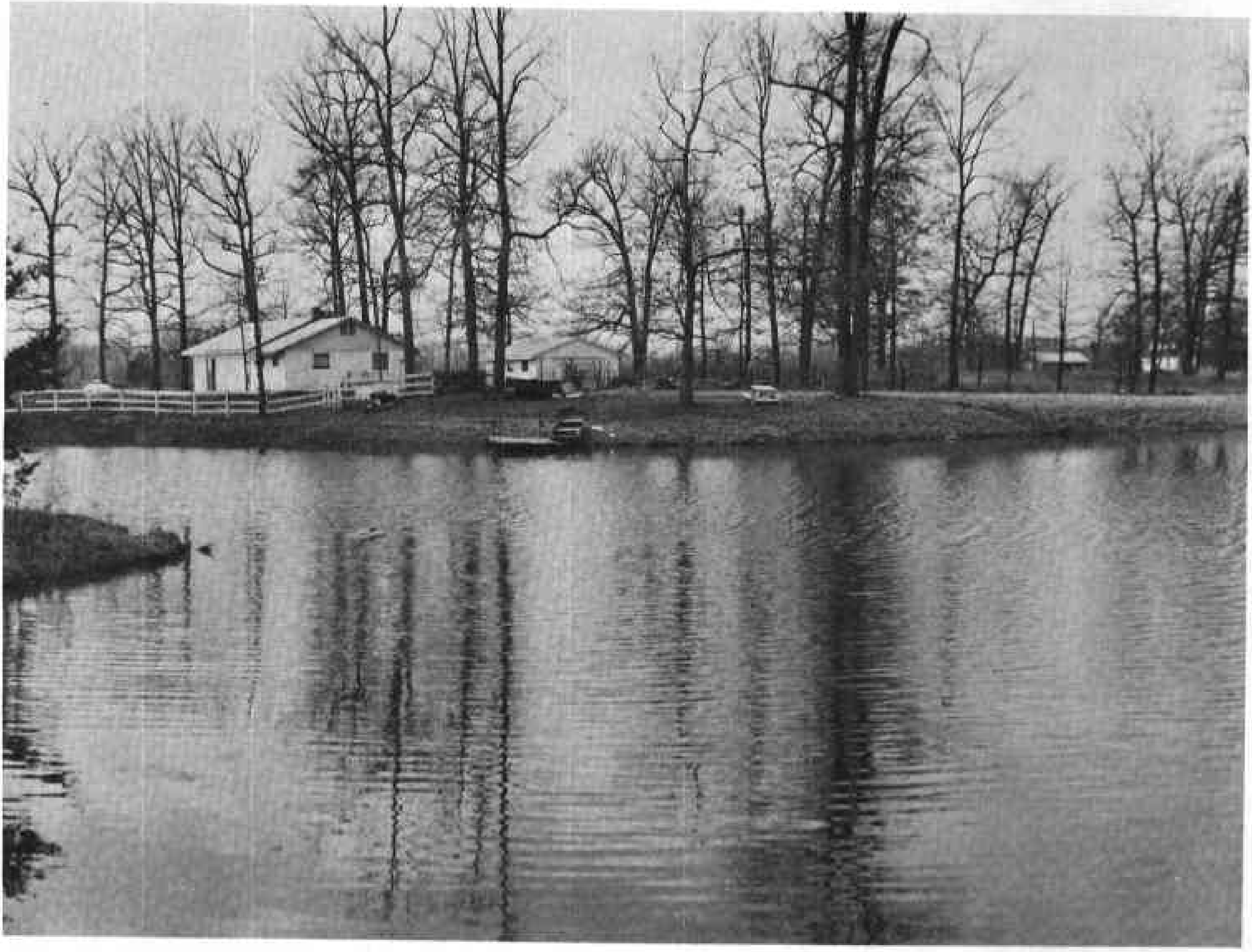


Figure 8.—**Pond constructed on Hickory and Cincinnati soils.**

The major limitations of these soils for uses associated with town and country planning are the steepness of the Hickory soils and the very slow permeability of the Ava and Cincinnati soils.

8. *Reesville-Ragsdale association*

Deep, somewhat poorly drained and very poorly drained, medium-textured, nearly level to slightly depressional soils on uplands

This association consists of nearly level to slightly depressional soils on uplands. It occupies about 7 percent of the county. Of this, about 75 percent is Reesville soils, 20 percent is Ragsdale soils, and 5 percent is minor soils.

The Reesville soils are somewhat poorly drained, nearly level soils that formed in loess material. The surface layer is grayish-brown silt loam. The subsoil is mottled light grayish-brown and yellowish-brown silty clay loam that grades to silt loam.

The Ragsdale soils are very poorly drained, nearly level to slightly depressional soils that formed in loess material. The surface layer is very dark gray heavy silt loam that grades to black light silty clay loam. The subsoil is olive-gray and yellowish-brown light silty clay loam that is mottled with shades of olive and gray.

The minor soils in this association are in the Muren and Hickory series and are on uplands. The Muren are moderately well drained, nearly level to gently sloping soils. The Hickory are well-drained, moderately steep to very steep soils.

The major soils in this association are suited to all cultivated crops commonly grown in the county if a suitable drainage system is established and maintained. Wetness is the major limitation to use and management (fig. 9).

The major limitations for uses associated with town and country planning are wetness and slow permeability.

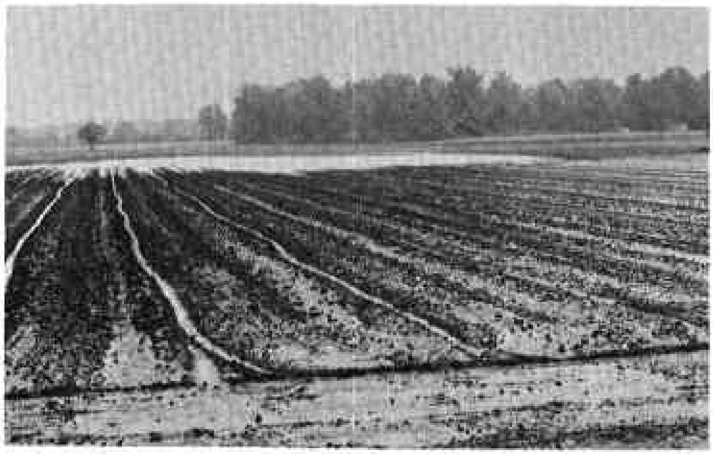


Figure 9.—**Reesville-Ragsdale association after a heavy rain. Water is standing on the slightly depressional Ragsdale soil.**

Descriptions of the Soils

This section describes the soil series and mapping units of Vigo County. The acreage and proportionate extent of each mapping unit are given in table 1.

The procedure is first to describe the soil series, and then the mapping units in that series. The soil described as representative in the series description is considered representative of all the soils of the series in the county. If the soil in a mapping unit has a profile that differs from the representative profile, the differences are stated in the description of the mapping unit unless the differences are apparent in the name of the mapping unit. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs. As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Strip mines and Gravel pits, for example, are land types that do not belong to a soil series. They are listed, nevertheless, in alphabetic order along with the soil series.

In comparing a mapping unit with a soil series, many readers will prefer to read the short description in paragraph form. It precedes the technical description that identifies layers by A, B, and C horizons and depth ranges. The technical profile descriptions are mainly for soil scientists and others who want detailed information about the soils. Unless otherwise indicated, the colors given in the description are those of a moist soil. The symbol following color names in the representative profile descriptions refers to a standard color notation. Some of the terms used to describe the soils are defined in the Glossary at the back of this soil survey.

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit in which the mapping unit has been placed. The page on which each capability unit is described can be found by referring to the "Guide to Mapping Units" at the back of this survey.

Descriptions, names, and delineations of soils in this soil survey do not agree fully with soil maps in adjacent counties published at a different date. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, and the extent of soils within the survey area. In some places it is more feasible to combine small acreages of similar soils that respond to use and management in much the same way than it is to separate these soils and give them names.

Ade Series

The Ade series consists of deep, somewhat excessively drained, gently sloping and moderately sloping soils on terraces and adjacent uplands. These soils formed in wind- and water-deposited sands under a native vegetative cover of prairie grasses.

In a representative profile the surface layer is very dark grayish-brown loamy fine sand about 11 inches thick. The upper part of the subsoil, about 21 inches thick, is brown and dark yellowish-brown, loose to very friable loamy fine sand and fine sand. The lower 68 inches of the subsoil is yellowish-brown and light yellowish-brown, loose fine sand that is banded with dark-brown, friable fine sandy loam. The underlying material is pale-brown and light yellowish-brown, loose fine sand.

Ade soils have low available water capacity, have rapid permeability, and are droughty.

Representative profile of Ade loamy fine sand, 2 to 6 percent slopes, in a cultivated field at a point 360 feet west and 540 feet south of the center of sec. 17, T. 13 N., R. 8 W.:

Ap—0 to 11 inches, very dark grayish-brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) when dry; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary.

B1—11 to 18 inches, brown (10YR 4/3) loamy fine sand to fine sand, brown (10YR 5/3) when dry; very weak, coarse, granular structure; very friable; neutral; abrupt, wavy boundary.

B21—18 to 32 inches, dark yellowish-brown (10YR 4/4) fine sand; single grained; loose; dark-brown (10YR 3/3) fine sandy loam lamellae, which are very thin (1/16 to 3/32 inch thick), discontinuous, and 4 to 6 inches apart; neutral; clear, wavy boundary.

B&Bt—32 to 60 inches, yellowish-brown (10YR 5/4) fine sand that has bands of dark-brown (7.5YR 4/4) fine sandy loam; these are wavy, 1/4 to 6 inches thick, and 2 to 6 inches apart; B horizon is single grained and loose; Bt horizon has weak, fine, subangular blocky structure and is friable; sand grains are bridged with clay films in the bonds; neutral; gradual, wavy boundary.

B3—60 to 102 inches, light yellowish-brown (10YR 6/4) fine sand and brown (7.5YR 4/4) light sandy loam in bands; weak, coarse, subangular blocky structure to massive; very friable; sand grains are bridged with clay films in the bands; slightly acid; gradual, irregular boundary.

C—102 to 132 inches, brown (10YR 5/3) fine sand; single grained; loose; grades to pale brown (10YR 6/3) with depth; slightly acid in upper part, and mildly alkaline and calcareous in lower part.

The Ap, or A1, horizon ranges in color from very dark brown to dark brown and is 10 to 16 inches thick. The B1 horizon is loamy fine sand or fine sand. Depth to the Bt horizon commonly ranges from 2 to 3 feet, but thin, discontinuous bands (lamellae) are sightly higher in the profile in places. The bands generally range from ¼ inch to 6 inches in thickness, are loamy sand to light sandy clay loam, and are 1 to 6 inches apart. Bands at a depth above 60 inches are higher in content of clay than bands at a depth below 60 inches.

TABLE 1.—*Approximate acreage and proportionate extent of soils*

Soil	Area	Extent
	Acres	*Percent*
Ade loamy fine sand, 2 to 6 percent slopes	2,100	0.8
Ade loamy fine sand, 6 to 12 percent slopes	430	.2
Alford silt loam, 2 to 6 percent slopes, eroded	1,900	.7
Alford silt loam, 6 to 12 percent slopes, eroded	640	.2
Alford silt loam, 6 to 12 percent slopes, severely eroded	760	.3
Alford silt loam, 12 to 18 percent slopes, eroded	430	.2
Alford silt loam, 12 to 18 percent slopes, severely eroded	353	.1
Alford silt loam, 18 to 25 percent slopes, eroded	325	.1
Alford silt loam, 25 to 40 percent slopes	316	.1
Armiesburg silty clay loam	6,900	2.6
Ava silt loam, 2 to 6 percent slopes, eroded	5,400	2.0
Ayrshire fine sandy loam	5,400	2.0
Bartle silt loam	940	.4
Bloomfield loamy fine sand, 2 to 6 percent slopes	1,900	.7
Bloomfield loamy fine sand, 6 to 12 percent slopes	1,750	.7
Bloomfield loamy fine sand, 12 to 18 percent slopes	332	.1
Borrow pits	435	.2
Camden silt loam, 0 to 2 percent slopes	1,350	.5
Camden silt loam, 2 to 6 percent slopes	1,100	.4
Cincinnati silt loam, 6 to 12 percent slopes, eroded	1,200	.5
Cincinnati silt loam, 6 to 12 percent slopes, severely eroded	4,900	1.8
Cincinnati silt loam, 12 to 18 percent slopes, severely eroded	920	.3
Cory silt loam	9,500	3.6
Crane silt loam	2,050	.8
Eel silt loam	2,850	1.1
Elston sandy loam, 0 to 2 percent slopes	16,200	6.1
Elston sandy loam, 2 to 6 percent slopes	3,150	1.2
Fincastle silt loam	5,800	2.2
Fox sandy loam, 0 to 2 percent slopes	465	.2
Fox sandy loam, 2 to 6 percent slopes, eroded	470	.2
Fox clay loam, 6 to 12 percent slopes, severely eroded	197	.1
Genesee silt loam	9,600	3.6
Genesee fine sandy loam, sandy variant	1,200	.5
Gravel pits	1,200	.5
Hennepin loam, 25 to 50 percent slopes	10,900	4.1
Hickory loam, 18 to 25 percent slopes	6,800	2.6
Hickory loam, 25 to 40 percent slopes	17,900	6.7
Iva silt loam, 0 to 2 percent slopes	27,200	10.2
Iva silt loam, 2 to 4 percent slopes	1,750	.7
Made land	680	.3
Millsdale silty clay loam	156	.1
Muren silt loam, 0 to 2 percent slopes	2,250	.8
Muren silt loam, 2 to 6 percent slopes, eroded	1,900	.7
Negley loam, 18 to 25 percent slopes	236	.1
Negley loam, 25 to 40 percent slopes	345	.1
Parke silt loam, 2 to 6 percent slopes, eroded	173	.1
Parke silt loam, 12 to 18 percent slopes, eroded	265	.1
Petrolia silty clay loam	7,900	3.0
Princeton fine sandy loam, 2 to 6 percent slopes	3,100	1.2
Princeton fine sandy loam, 6 to 12 percent slopes, eroded	1,400	.5
Princeton fine sandy loam, 12 to 18 percent slopes, eroded	590	.2
Princeton fine sandy loam, 18 to 25 percent slopes, eroded	520	.2
Proctor silt loam	3,100	1.2
Ragsdale silt loam	8,500	3.2
Randolph silt loam, 0 to 3 percent slopes	740	.3
Reesville silt loam	16,900	6.4
Rensselaer loam	4,100	1.5
Rensselaer clay loam	1,650	.6
Rodman gravelly loam, 25 to 50 percent slopes	240	.1
Russell silt loam, 2 to 6 percent slopes, eroded	2,000	.7
Russell silt loam, 6 to 12 percent slopes, eroded	570	.2
Russell silt loam, 6 to 12 percent slopes, severely eroded	900	.3
Russell silt loam, 12 to 18 percent slopes, eroded	377	.1
Shoals silt loam	8,300	3.1
Sloan clay loam	2,200	.8
Strip mines	6,900	[1] 2.6
Tippecanoe silt loam	890	.3
Vincennes loam	285	.1
Wakeland silt loam	8,000	3.0
Warsaw sandy loam, 0 to 2 percent slopes	6,200	2.3
Warsaw sandy loam, 2 to 6 percent slopes, eroded	2,300	.9
Washtenaw silt loam	720	.3
Westland clay loam	600	.2
Whitaker loam	2,800	1.1
Xenia silt loam, 2 to 6 percent slopes, eroded	4,000	1.5
Zipp silty clay	3,300	1.2
Water	3,500	1.3
Total	265,600	100.0

---

[1] Does not include water acreage.

Ade soils have drainage similar to that of Bloomfield soils and are associated with Elston soils. They have a thicker, darker colored surface layer than Bloomfield soils. Ade soils have a B horizon in which clay occurs in bands, but there is a more uniform distribution of clay in Elston soils.

Ade loamy fine sand, 2 to 6 percent slopes (AdB).—This soil is in undulating, dunelike areas on terraces and adjacent uplands. It has the profile described as representative for the series. Included in mapping are small areas of Bloomfield and Elston soils.

Soil blowing is a major hazard to the use and management of this soil. Droughtiness also is a limitation, and crops are likely to be damaged during prolonged dry periods.

This soil is marginal for crops. Corn, soybeans, small grain, grasses for hay and pasture, and specialty crops such as melons are grown. Capability unit IIIs-1.

Ade loamy fine sand, 6 to 12 percent slopes (AdC).—This soil is in undulating, dunelike areas on terraces and adjacent uplands. It has a profile similar to the one described as representative for the series, but it is more variable in depth to bands of fine sandy loam and in the thickness of the present dark-colored surface layer. On windward slopes, the dark surface layer is commonly thinner and the depth to bands of fine sandy loam is less than they are on leeward slopes.

Droughtiness is a major limitation, and soil blowing and water erosion are hazards to the use and management of this soil. Crops are likely to be damaged during long dry periods.

This soil is marginal for crops. Corn, soybeans, small grain, grasses for hay and pasture, and specialty crops such as melons are grown. Capability unit IIIe-12.

Alford Series

The Alford series consists of deep, well-drained, gently sloping to very steep soils on uplands. These soils formed in more than 5 feet of loess under a native vegetation of mixed hardwood trees.

In a representative profile the surface layer is brown silt loam about 8 inches thick. The subsoil is about 37 inches thick and is brown. In sequence from the top, the upper 6 inches of the subsoil is friable heavy silt loam, the next 17 inches is firm silty clay loam grading to light silty clay loam, and the lower 14 inches is friable heavy silt loam. The underlying material is strong-brown silt loam.

Alford soils have high available water capacity and moderate permeability.

Representative profile of Alford silt loam, 2 to 6 percent slopes, eroded, in a cultivated field at a point 260 feet east and 300 feet south from the northwest corner of SW¼NE¼ sec. 1, T. 12 N., R. 8 W.:

Ap—0 to 8 inches, brown (10YR 4/3) silt loam; moderate, fine and medium, granular structure; friable; neutral; abrupt, smooth boundary.

B1—8 to 14 inches, brown (7.5YR 4/4) heavy silt loam; weak, fine and medium, subangular blocky structure; friable; neutral; clear, wavy boundary.

B21t—14 to 26 inches, brown (7.5YR 4/4) silty clay loam; moderate to strong, medium, subangular blocky structure; firm; thick, continuous, reddish-brown (5YR 4/3) clay films on all peds; few pale-brown (10YR 6/3) silt coats on vertical faces of peds; strongly acid; clear, wavy boundary.

B22t—26 to 31 inches, brown (7.5YR 4/4) light silty clay loam; moderate, coarse and medium, subangular blocky structure; firm; thin, continuous, reddish-brown (5YR 4/3) clay films on most peds; few pale-brown (10YR 6/3) silt coats on vertical faces of peds; strongly acid; clear, wavy boundary.

B3t—31 to 45 inches, brown (7.5YR 4/4) heavy silt loam; weak, coarse, subangular blocky structure; friable; few, thin, discontinuous, reddish-brown (5YR 4/3) clay films on faces of peds; few light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) silt coats on vertical faces of peds; few very dark brown (10YR 2/2) splotches; very strongly acid; gradual, wavy boundary.

C—45 to 78 inches, strong-brown (7.5YR 5/6) and brown (7.5YR 4/4) silt loam; massive; friable; few light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) silt streaks in the upper part; medium acid.

Thickness of the solum ranges from 40 to 60 inches. The Ap horizon ranges from dark grayish brown to brown. In eroded areas the Ap horizon typically is brown, but it is yellowish brown in places. A brown A2 horizon, 2 to 6 inches thick, is present in some areas that have not been disturbed by tillage. The B2t horizon ranges from brown to yellowish brown and from heavy silt loam to silty clay loam. The C horizon is strong brown or yellowish brown and medium acid to slightly acid.

Alford soils have drainage similar to that of Cincinnati and Princeton soils. They differ from Cincinnati soils because they formed in loess more than 60 inches thick and lack a fragipan. Alford soils are more silty and contain less sand than Princeton soils.

Alford silt loam, 2 to 6 percent slopes, eroded (AlB2).—This soil is on narrow ridgetops and in areas along more steeply sloping soils. It has the profile described as representative for the series. Included in mapping are small areas of Alford soils that have a thicker surface layer and a few small areas where the plow layer is composed mostly of subsoil material. Also included are a few small areas of moderately well drained soils that have some gray mottles in the subsoil. A few small areas of soils that have underlying material that is coarser than normal also are included.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

This soil is well suited to cultivated crops if properly managed. It also is well suited to orchard crops. Capability unit IIe-3.

Alford silt loam, 6 to 12 percent slopes, eroded (AlC2).—This soil is on long, narrow ridges and short breaks adjacent to ridgetops or large level areas. It has a profile similar to the one described as representative for the series, except that it has a thinner surface layer and subsoil. Included in mapping are small areas of soils that have not been tilled and are only slightly eroded. A few areas of soils that have slopes of more than 12 percent and a few small areas that have coarser textured underlying material also are included.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

This soil is suited to all the common cultivated crops if it is properly managed. Orchard crops are suited if erosion is controlled. Capability unit IIIe-3.

Alford silt loam, 6 to 12 percent slopes, severely eroded (AlC3).—This soil is between ridgetops and severely eroded areas at the heads of draws. It has a profile similar to the one described as representative for the series, except that it has had from 6 inches to all of the original surface layer removed by erosion. In many places the subsoil is exposed. Numerous small gullies transect this soil (fig. 10). Included in mapping are a few small areas of deeply gullied Alford soils and a few areas of soils that have gentle and strong slopes. Also included are a few small areas of soils that have coarser textured underlying material than is normal for the Alford series.

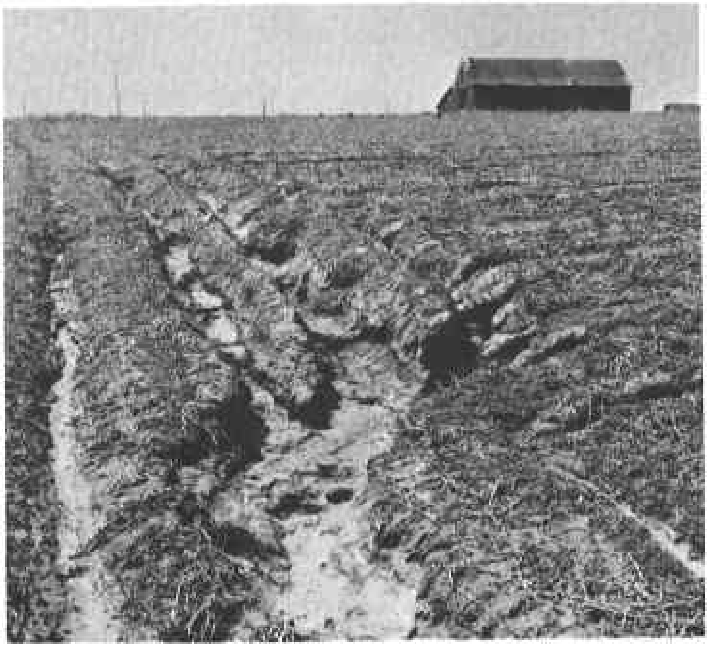


Figure 10.—An area of Alford silt loam, 6 to 12 percent slopes, severely eroded.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

This soil is suited to small grain, orchard crops, and meadow and pasture plants if erosion is controlled. Capability unit IVe-3.

Alford silt loam, 12 to 18 percent slopes, eroded (AlD2).—This soil is near heads of drainageways and immediately below narrow ridgetops. Most slopes are short. It has a profile similar to the one described as representative for the series, except that it has a thinner surface layer and subsoil. Included in mapping are a few small areas of moderately steep and steep soils. Also included are small areas of soils that have not been tilled and are only slightly eroded and a few small areas of Cincinnati and Princeton soils.

Runoff and the risk of erosion are the major limitations to the use and management of this soil. A severe hazard of erosion limits its use for row crops.

This soil is suited to small grain, orchard crops, and meadow and pasture plants. Capability unit IVe–3.

Alford silt loam, 12 to 18 percent slopes, severely eroded (AlD3).—This soil is immediately below ridgetops and adjacent to drainageways. Most slopes are short. It is also associated with other severely eroded soils near the heads of draws. It has a profile similar to the one described as representative for the series, except that it has a thinner surface layer and subsoil and has had from 6 inches to all the original surface layer removed by erosion. In most places the subsoil is exposed. Numerous small narrow gullies transect this soil. Included in mapping are a few small areas of deeply gullied Alford soils. Also included are a few small areas of soils that have slopes of less than 12 percent or more than 18 percent.

Runoff and the risk of erosion are the major limitations to the use and management of this soil. It is not suited to row crops.

This soil can be used for permanent pasture and trees. Orchard crops are suited if erosion is controlled. Small areas can be used for wildlife habitat. Capability unit VIe-1.

Alford silt loam, 18 to 25 percent slopes, eroded (AlE2).—This soil is immediately below ridges or large level areas. It is also along drainageways and short breaks along the major streams. It has a profile similar to the one described as representative for the series, except that it has a thinner surface layer and subsoil. Included in mapping are a few small areas of soils that have not been tilled or have been left in permanent pasture and are only slightly eroded. Also included are a few small areas of soils that have lost all of their original plow layer by erosion and have their subsoil exposed. Small areas of Hickory, Negley, and Princeton soils also are included.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

This soil is not suited to row crops. It can be used for permanent pasture or trees. Small areas can be used for wildlife habitat. Capability unit VIe–1.

Alford silt loam, 25 to 40 percent slopes (AlF).—This soil is immediately below ridges or large level areas and along drainageways and short breaks along the major streams. It has a profile similar to the one described as representative for the series, except that it has a thinner surface layer and subsoil. Also, most areas have not been plowed and a thin, dark-colored surface layer is commonly present. Included in mapping are a few small areas of soils that have lost a large part or all of their original surface layer because of erosion. Also included are a few small areas of Hickory, Negley, and Princeton soils.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

This soil is not suited to row crops. It is suited to timber production. Small areas can be used for wildlife habitat. Capability unit VIe–1.

Armiesburg Series

The Armiesburg series consists of deep, well-drained, nearly level soils on bottom lands. These soils formed in loamy alluvial deposits under a native cover of mixed hardwood trees and grasses.

In a representative profile the surface layer is about 20 inches of very dark grayish-brown silty clay loam. The subsoil is about 21 inches thick and is neutral, brown, firm silt loam. The stratified underlying material is brown silt loam, very fine sand, and coarse silt.

Armiesburg soils have high available water capacity and moderate permeability. These soils are subject to flooding.

Representative profile of Armiesburg silty clay loam in a cultivated field at a point 280 feet east and 140 feet south of the northwest corner of SW¼SE¼ sec. 33, T. 13 N., R. 9 W.:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silty clay loam; weak, medium, granular structure; friable; neutral; clear, wavy boundary.

A12—8 to 14 inches, very dark grayish-brown (10YR 3/2) silty clay loam; weak, fine, angular blocky structure; firm; neutral; clear, wavy boundary.

A13—14 to 20 inches, very dark grayish-brown (10YR 3/2) light silty clay loam, dark brown (10YR 3/3) when crushed; weak, fine, subangular blocky structure; firm; neutral; clear, wavy boundary.

B2—20 to 32 inches, brown (10YR 4/3) heavy silt loam; moderate, medium, subangular blocky structure; firm; thin, continuous, very dark grayish-brown (10YR 3/2) coatings in root channels and on faces of peds; neutral; gradual, wavy boundary.

B3—32 to 41 inches, brown (10YR 4/3) silt loam; weak, medium to coarse, subangular blocky structure; firm; thin, discontinuous, dark-brown (10YR 3/3) coatings on faces of peds; neutral; clear, wavy boundary.

C—41 to 72 inches, brown (10YR 4/3 and 10YR 5/3) stratified silt loam, coarse silt, and very fine sand; massive; friable; mildly alkaline and calcareous.

The thickness of the solum ranges from about 2 feet to 4 feet. The A horizon ranges from very dark brown to dark brown in color and from 12 to 22 inches in thickness. The B horizon dominantly is brown silty clay loam but ranges to brown silt loam in places. In some areas it has gray mottles at a depth below 30 inches. The underlying material typically is stratified and ranges from silty clay loam to silt loam, coarse silt, and very fine sand. The sandy texture generally is at a depth below 50 inches.

Armiesburg soils are associated with Genesee and Petrolia soils. They have a darker colored A horizon and have less sand in the A and B horizons than Genesee soils. They have a browner surface layer and better natural drainage than Petrolia soils.

Armiesburg silty clay loam (0 to 2 percent slopes) (Ar).—This soil is in broad areas on bottom lands. Included in mapping are small areas of Genesee soils and some small areas of soils that are not so well drained as this Armiesburg soil.

Flooding is the major limitation to the use and management of this soil. Some areas are protected by levees, but during periods of high water in winter and early in spring, seepage through levees causes some flooding.

This soil is suited to corn, soybeans, grain sorghum, and meadow plants. Alfalfa and small grain are subject to damage from flooding in winter and early in spring. Capability unit I–2.

Ava Series

The Ava series consists of deep, moderately well drained, gently sloping soils on uplands. These soils formed in 2 to 4 feet of loess and the underlying glacial till and are leached free of carbonates to a depth of 10 feet or more. They have a very firm and brittle fragipan at a depth of about 2½ feet. The native vegetation was mainly mixed hardwood trees.

In a representative profile the surface layer is dark grayish-brown silt loam about 6 inches thick. The subsoil is thicker than 60 inches. In sequence from the top, the upper 14 inches of the subsoil is yellowish-brown, firm light silty clay loam; the next 9 inches is yellowish-brown, firm light silty clay loam that is mottled with light brownish gray; and the next 29 inches is a very firm and brittle fragipan. The fragipan is mottled yellowish brown and light brownish gray and is heavy silt loam in the upper part and light silty clay loam in the lower part. The next layer of the subsoil, which extends to a depth of more than 108 inches, is mottled yellowish-brown and light brownish-gray light silty clay loam that grades to light clay loam as depth increases.

Ava soils have moderate available water capacity and very slow permeability.

Representative profile of Ava silt loam, 2 to 6 percent slopes, eroded, in a pasture at a point 720 feet south and 380 feet west of the northeast corner of sec. 24, T. 11 N., R. 8 W.:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam, brown (10YR 4/3) when crushed; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B1—6 to 9 inches, yellowish-brown (10YR 5/4) light silty clay loam; weak, fine, subangular blocky structure; firm; medium acid; clear, wavy boundary.

B21t—9 to 20 inches, yellowish-brown (10YR 5/6) light silty clay loam to silty clay loam; moderate, medium, subangular blocky structure; firm; thin, discontinuous, yellowish-brown (10YR 5/4) clay films on faces of some peds; few, small, black (10YR 2/1) iron and manganese oxide concretions in lower 2 inches of horizon; strongly acid; clear, wavy boundary.

B22t—20 to 29 inches, yellowish-brown (10YR 5/6) light silty clay loam; few, fine, distinct, light brownish-gray (10YR 6/2) mottles; moderate, medium and coarse, subangular blocky structure; firm; thin, discontinuous, yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 4/4) clay films on faces of peds; many, medium, very dark brown (10YR 2/2) iron and manganese oxide concretions; strongly acid; clear, irregular boundary.

Bx1—29 to 41 inches, yellowish-brown (10YR 5/6) heavy silt loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; moderate, medium and coarse, prismatic structure; very firm and brittle; thin, discontinuous, light brownish-gray (10YR 6/2) clay films on most peds and in linings of voids; thin to thick, light-gray (10YR 7/2) silt coatings on faces of some prisms and occurring as cappings on the tops of prisms and as vertical crack fillings; many, medium, very dark brown (10YR 2/2) iron and manganese oxide concretions; strongly acid; gradual, wavy boundary.

IIBx2—41 to 58 inches, mottled yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) light silty clay loam; moderate, very coarse, prismatic structure parting to moderate, thick, platy structure; very firm and brittle; thin, discontinuous, light brownish-gray (10YR 6/2) clay films on faces of prisms and in linings of some voids; thin light-gray (10YR 7/2) silt coatings on some peds; thin light-gray (10YR 7/2) silt fills in vertical cracks; small pebbles throughout horizon; few, small, soft, very dark brown (10YR 2/2) iron and manganese oxide segregations; strongly acid; gradual, wavy boundary.

IIB31—58 to 72 inches, yellowish-brown (10YR 5/6) light silty clay loam; many, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, very coarse, prismatic structure parting to weak, coarse, subangular blocky structure; firm; few, medium, soft, very dark brown (10YR 2/2) iron and manganese oxide segregations; several small pebbles; medium acid; gradual, wavy boundary.

IIIBb32—72 to 108 inches, mottled yellowish-brown (10YR 5/6), light brownish-gray (10YR 6/2), and light-gray (10YR 7/2) light clay loam; weak, coarse, prismatic structure but massive inside the prisms; firm; many pebbles of varying sizes; thin to thick, discontinuous clay films on faces of prisms; few iron and manganese segregations; slightly acid in the upper part, becoming neutral as depth increases.

The Ap horizon ranges from dark grayish brown to brown or grayish brown. An A2 horizon is present in some areas that are not eroded. Depth to the fragipan ranges from 22 to 32 inches. The fragipan ranges from 18 to 36 inches in thickness. Texture ranges from light silty clay loam to silt loam in the upper part and grades to light clay loam in the lower part in places. The lower part of the pan generally contains small pebbles. The material underlying the fragipan ranges from loam or silt loam to light silty clay loam or light clay loam. In places the silt loam and silty clay loam contain enough sand to have a gritty feel. The underlying material ranges from strongly acid in the upper part to mildly alkaline in the unleached till. Thickness of the loess cap ranges from 24 to 48 inches.

Ava soils are associated with Cincinnati and Iva soils. They are less well drained than Cincinnati soils. They formed in a thinner deposit of loess and are naturally better drained than Iva soils. In addition, Ava soils have a fragipan that is lacking in Iva soils.

Ava silt loam, 2 to 6 percent slopes, eroded (AvB2).—This soil is on narrow ridgetops and in areas along drainageways. Included in mapping are small areas of Cincinnati and Muren soils. Also included are a few areas of soils that are either more eroded or less eroded than this soil.

Erosion and runoff are the major limitations to the use and management of this soil, but the very slowly permeable fragipan and medium available water capacity also are limitations. Crops are likely to be damaged during prolonged dry periods.

This soil is suited to most commonly grown crops in the county. Alfalfa and other deep-rooted crops are not well suited, because the fragipan restricts downward movement of roots. Capability unit IIe–7.

Ayrshire Series

The Ayrshire series consists of deep, somewhat poorly drained, nearly level soils on uplands and terraces. These soils formed in stratified sandy material under a native vegetation of mixed hardwoods.

In a representative profile the surface layer is grayish-brown fine sandy loam about 10 inches thick, and the subsurface layer is light-gray fine sandy loam about 3 inches thick. Next is a layer of light-gray fine sandy loam about 5 inches thick. The subsoil is about 38 inches thick. The upper 20 inches of the subsoil is mottled yellowish-brown and gray, firm heavy sandy clay loam, and the lower 18 inches is mottled gray and yellowish-brown, very friable fine sandy loam. The underlying material is brown fine sand that is mottled with gray.

Ayrshire soils have high available water capacity and moderate permeability.

Representative profile of Ayrshire fine sandy loam in a field of clover at a point 440 feet east and 480 feet north of the southwest corner of NE¼SW¼ sec. 12, T. 13 N., R. 8 W.:

Ap—0 to 10 inches, grayish-brown (10YR 5/2) fine sandy loam; weak, fine, granular structure; friable; common black (10YR 2/1) iron and manganese concretions; neutral; abrupt, smooth boundary.

A2—10 to 13 inches, light-gray (10YR 6/1) fine sandy loam, white (10YR 8/1) when dry; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; moderate, medium, platy structure; friable; common black (10YR 2/1) iron and manganese concretions; neutral; clear, wavy boundary.

A&B—13 to 18 inches, light-gray (10YR 6/1) fine sandy loam; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; weak, coarse, subangular blocky structure; friable; thin, discontinuous, light-gray (10YR 6/1) clay film lining in some voids and on faces of few peds; common black (10YR 2/1) iron and manganese concretions; thin gray (10YR 7/1) silt coatings on faces of most peds; slightly acid; clear, irregular boundary.

B2tg—18 to 38 inches, mottled yellowish-brown (10YR 5/6) and gray (10YR 5/1) heavy sandy clay loam; weak, medium, prismatic structure parting to moderate, medium and coarse, subangular blocky structure; firm; medium, discontinuous, light-gray (10YR 6/1) clay films on faces of peds; thin gray (10YR 5/1) and light-gray (10YR 7/1) fine sandy loam material from the horizons above in old voids and root channels; common black (10YR 2/1) iron and manganese concretions; strongly acid; clear, irregular boundary.

B3g—38 to 56 inches, mottled gray (10YR 6/1) and yellowish-brown (10YR 5/8) fine sandy loam; weak, coarse, subanuglar blocky structure; very friable; common black (10YR 2/1) iron and manganese concretions; medium acid; clear, wavy boundary.

C—56 to 74 inches, brown (10YR 5/3) fine sand; many, medium, distinct, gray (10YR 6/1) mottles; single grained; loose; slightly acid.

The Ap horizon ranges from dark grayish brown to dark brown and brown. The light-gray A2 horizon is lacking in some areas. The B2 horizon ranges from sandy clay loam to clay loam. Reaction is generally medium acid or strongly acid but ranges to slightly acid in places. Depth to the C horizon ranges from 36 to 60 inches. This horizon is fine sand that has stratified layers of silt, light sandy clay loam, or loam in places.

Ayrshire soils are associated with Princeton and Rensselaer soils. They are naturally more poorly drained and are grayer than Princeton soils. They are lower in organic-matter content, have a lighter colored plow layer, and have better natural drainage than Rensselaer soils.

Ayrshire fine sandy loam (0 to 2 percent slopes) (Ay).—This soil is on uplands and terraces. On terraces the surface layer is medium sandy loam in places. Included in mapping are a few small areas of soils that have a surface layer of loam. Also included are a few small areas of the poorly drained Rensselaer soils.

Wetness is a major limitation to the use and management of this soil.

This soil is suited to corn, soybeans, small grain, and meadow and pasture plants if a suitable drainage system is established and maintained. It also is suited to vegetable crops if a source of water is available for irrigation and if drainage is adequate. Capability unit IIIw-4.

Bartle Series

The Bartle series consists of deep, somewhat poorly drained, nearly level soils on terraces. These soils formed in silty material and old alluvium and have a very firm and brittle fragipan at a depth of about 2 to 2½ feet. The native vegetation was mixed hardwood trees.

In a representative profile the surface layer is about 8 inches of grayish-brown silt loam. The subsurface layer is light brownish-gray silt loam that is mottled with yellowish brown and is about 6 inches thick. The subsoil, which extends to a depth of about 50 inches, is mottled pale-brown, yellowish-brown, and light brownish-gray heavy silt loam. A very firm and brittle fragipan begins at a depth of about 26 inches and extends to a depth of about 40 inches in most places. The subsoil is strongly acid and very strongly acid. The underlying material is mottled light brownish-gray and yellowish-brown, firm silty clay loam. It is strongly acid in the upper part and becomes medium acid as depth increases.

Bartle soils have moderate available water capacity and very slow permeability.

Representative profile of Bartle silt loam in a cultivated field at a point 480 feet east and 220 feet south of the northwest corner of sec. 24, T. 13 N., R. 8 W.:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; weak, fine, granular structure; friable; neutral; abrupt, smooth boundary.

A2—8 to 14 inches, light brownish-gray (10YR 6/2) silt loam; many, medium, distinct, yellowish-brown (10YR 5/6, 10YR 5/8) mottles; weak, thick, platy structure; friable; few very dark brown (10YR 2/2) iron and manganese concretions; medium acid; clear, wavy boundary.

B2t—14 to 26 inches, pale-brown (10YR 6/3) heavy silt loam; many, medium, faint, light brownish-gray (10YR 6/2) mottles and common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; thin, discontinuous, brown (10YR 5/3) clay films on faces of peds; few very dark brown (10YR 2/2) iron and manganese concretions; strongly acid; clear, wavy boundary.

Bxg—26 to 40 inches, light brownish-gray (10YR 6/2) heavy silt loam; few, medium, prominent, strong-brown (7.5YR 5/8) mottles and common, medium, distinct, yellowish-brown (10YR 5/4, 10YR 5/6, 10YR 5/8) mottles; weak to moderate, coarse, prismatic structure, but massive on the inside of prisms; some prism faces have thin to medium, light-gray (10YR 7/2) silt coatings; very firm and brittle; few, thin, discontinuous, grayish-brown (10YR 5/2) clay films on faces of peds; many very dark brown (10YR 2/2) iron and manganese concretions; very strongly acid; clear, wavy boundary.

C—40 to 70 inches, mottled light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/6) light silty clay loam that has strata of silt loam in lower part; massive; firm; common very dark brown (10YR 2/2) iron and manganese concretions; strongly acid in upper part, becoming medium acid in lower part.

The thickness of the solum is commonly about 3½ to 5 feet. The Ap horizon ranges in color from dark grayish brown to grayish brown or brown. The Bx horizon ranges in texture from silt loam to light silty clay loam. The depth to the fragipan ranges from 22 to 34 inches. The fragipan generally is weakly expressed but is moderately expressed in some places. The stratified underlying material ranges from silt loam to silty clay loam that has thin layers of fine sandy loam. Reaction is strongly acid in the upper part and becomes less acid as depth increases.

Bartle soils have drainage similar to that of Iva and Whitaker soils. They have a fragipan that is lacking in Iva and Whitaker soils, and they contain more silt than Whitaker soils.

Bartle silt loam (0 to 2 percent slopes) (Ba).—This soil is on terraces near the base of upland areas along major streams. Included in mapping are areas of soils that have slightly steeper slopes and small areas of the more poorly drained Vincennes soils.

Wetness and the very slowly permeable fragipan are the major limitations to the use and management of this soil. This slowly permeable layer restricts root penetration and water movement.

This soil is suited to corn, soybeans, and small grain if a suitable drainage system is established and maintained. Meadow and pasture plants also can be grown. Alfalfa and other deep-rooted crops are not well suited, because the fragipan restricts root penetration. Lime is needed if legumes are grown. Capability unit IIw–2.

Bloomfield Series

The Bloomfield series consists of deep, somewhat excessively drained, gently sloping to strongly sloping soils on terraces and uplands. These soils formed in wind- and water-deposited sands under a native vegetative cover of mixed hardwood trees.

In a representative profile the surface layer is dark grayish-brown loamy fine sand about 7 inches thick. The upper part of the subsoil, about 25 inches thick, is yellowish-brown loose loamy fine sand. The lower 38 inches of the subsoil is light yellowish-brown, loose fine sand that has discontinuous bands of dark-brown, friable fine sandy loam. The underlying material is light yellowish-brown, loose fine sand.

Bloomfield soils have low available water capacity and moderately rapid to rapid permeability. These soils are droughty.

Representative profile of Bloomfield loamy fine sand, 2 to 6 percent slopes, in an idle field at a point 40 feet east and 450 feet south of the NE¼SE¼ sec. 20, T. 13 N., R. 8 W.:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) loamy fine sand; weak, fine, granular structure; very friable; medium acid; abrupt, smooth boundary.

B1—7 to 32 inches, yellowish-brown (10YR 5/6) loamy fine sand; single grained; loose; slightly acid; abrupt, wavy boundary.

A&B—32 to 70 inches, light yellowish-brown (10YR 6/4) fine sand (A) that has discontinuous bands of brown (7.5YR 4/4) fine sand loam (B2t) in the upper part of the horizon; the textural bands are generally 1 inch to 4 inches apart and ¼ to 1 inch thick; in the lower part the bands are thicker, and one is 6 inches thick; the A horizon is single grained and loose; the B2t horizon has weak, medium, subangular blocky structure and is friable; sand grains are bridged with clay films in the bands; slightly acid in the upper part and neutral in the lower part; gradual, irregular boundary.

C—70 to 80 inches, light yellowish-brown (10YR 6/4) fine sand; single grained; loose; few, thin, discontinuous bands of brown (7.5YR 4/4) fine sandy loam; neutral.

The Ap horizon ranges from dark grayish brown to brown. In undisturbed areas a thin, very dark grayish-brown A1 horizon and a light-colored A2 horizon of loamy fine sand or fine sand are present. Depth to the B2t horizon ranges from 24 to 36 inches. The textural bands generally range between ¼ inch to 6 inches in thickness and from loamy sand to heavy sandy loam or light sandy clay loam. The thickness of the B horizon material between the bands ranges from 1 inch to 10 inches. Bands at a depth of less than 60 inches are higher in content of clay than bands below a depth of 60 inches.

Bloomfield soils have drainage similar to that of Ade soils and are associated with Princeton soils. They have a lighter colored plow layer that contains less organic matter than Ade soils. Bloomfield soils are more sandy than Princeton soils and lack a continuous textural B horizon.

Bloomfield loamy fine sand, 2 to 6 percent slopes (BlB).—This soil is on ridgetops and at the base of steeper slopes. It has the profile described as representative for the series. Included in mapping are a few small areas of nearly level, sandy soils and a few small areas of Princeton soils.

The risk of erosion and the low available water capacity are limitations to the use and management of this soil. Crops are likely to be damaged during prolonged dry periods.

This soil is marginal for most crops. Corn, soybeans, small grain, and alfalfa are grown. The soil is well suited to orchard crops and melons. Capability unit IIIs–1.

Bloomfield loamy fine sand, 6 to 12 percent slopes (BlC).—This soil is in undulating, dunelike areas and on short, irregularly shaped slopes. It has a profile similar to the one described as representative for the series, but it is more variable in the depth to textural bands and the thickness of the present surface layer. On windward slopes the surface layer is commonly thinner and depth to textural bands is less than on leeward slopes. Included in mapping are small areas of Princeton soils.

The risk of erosion and the low available water capacity are limitations to the use and management of this soil. Crops are likely to be damaged during prolonged dry periods.

This soil is marginal for most crops. Corn, soybeans, small grain, alfalfa, and meadow plants are grown. The soil is well suited to orchard crops and melons. Capability unit unit IIIe–12.

Bloomfield loamy fine sand, 12 to 18 percent slopes (BlD).—This soil has short, irregularly shaped slopes. It has a profile similar to the one described as representative for the series, but it is more variable in the depth to textural bands and in places has a thinner surface layer and subsoil.

The depth to textural bands generally is greater and the surface layer is thicker on the east side of slopes, where the wind has redeposited sand. Included in mapping are a few small areas of steep Bloomfield soils and small areas of Princeton soils.

The risk of erosion and the low available water capacity are limitations to the use and management of this soil. Crops are likely to be damaged during prolonged dry periods.

This soil is marginal for crops. Small grain, alfalfa, and meadow and orchard crops are grown. Capability unit IVe–12.

Borrow Pits

Borrow pits (Bp) consists of areas where soil material has been removed to various depths. Most of these areas have been used as a source of highway fill and are located near major highways. They are mostly 10 to 25 acres in size but range from 2 to 70 acres or more.

Some areas of this land type have had only the upper 3 or 4 feet of soil removed. Generally, however, as much as 10 feet or more of soil material has been removed and a pit has been formed. Most of the pits are filled with water, which provides a potential for fishing and other recreational uses.

Borrow pits are mainly in areas of Elston soils on terraces, Reesville soils on uplands, and Genesee soils on bottom lands. Where soil material has been removed to a depth of several feet, the sides of the pit generally are steep and are subject to severe erosion. Exposed sides can erode and add sediment to the water in the pit. A permanent vegetative cover helps to prevent erosion and sedimentation. Capability unit not assigned.

Camden Series

The Camden series consists of deep, well-drained, nearly level to gently sloping soils on terraces along the major streams in the county. These soils formed in about 2 to 3 feet of loess and the underlying stratified loam, sandy loam, or silt loam outwash. The native vegetation was mixed hardwood trees.

In a representative profile the surface layer is grayish-brown silt loam about 10 inches thick. The subsoil is about 32 inches thick. The upper 26 inches of the subsoil is dark yellowish-brown, firm light silty clay loam, and the lower 6 inches is dark yellowish-brown, friable sandy clay loam. The underlying material is brown, stratified sandy clay loam, loamy sand, and gravelly sandy clay loam.

Camden soils have high available water capacity and moderate permeability.

Representative profile of Camden silt loam, 0 to 2 percent slopes, in a meadow at a point 50 feet south and 50 feet west of the northeast corner of NW¼NE¼ sec. 35, T. 13 N., R. 9 W.:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A2—8 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, platy structure parting to weak, medium, granular structure; friable; slightly acid; clear, wavy boundary.

B1—10 to 14 inches, brown (10YR 4/3) heavy silt loam; moderate, fine, subangular blocky structure; friable; slightly acid; clear, wavy boundary.

B21t—14 to 30 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; moderate, medium, subangular blocky structure; firm; thin, continuous, dark yellowish-brown (10YR 3/4) clay films on faces of peds; medium acid; clear, wavy boundary.

B22t—30 to 36 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; weak, coarse, subangular blocky structure; firm; thin, continuous, dark yellowish-brown (10YR 3/4) clay films on faces of most peds; strongly acid; clear, wavy boundary.

IIB3t—36 to 42 inches, dark yellowish-brown (10YR 4/4) sandy clay loam; weak, coarse, subangular blocky structure; friable; thin, discontinuous, dark yellowish-brown (10YR 3/4) clay films on some faces of peds; medium acid; clear, wavy boundary.

IIC1—42 to 57 inches, brown (7.5YR 4/4) sandy clay loam that is stratified with loamy sand; massive to single grained; friable to loose; medium acid; clear, wavy boundary.

IIC2—57 to 72 inches, dark yellowish-brown (10YR 3/4) gravelly sandy clay loam; massive; friable; medium acid.

The Ap ranges from dark grayish brown to brown. An A2 horizon is absent in some places, particularly on the steeper slopes that have been tilled and where some erosion has occurred. The B horizon is dominantly dark yellowish brown but ranges from dark brown to yellowish brown. In some areas gray mottles occur below a depth of 30 inches. The B horizon ranges from heavy silt loam to medium silty clay loam in the upper part and from sandy clay loam or clay loam to gravelly sandy loam in the lower part. The C horizon has stratified layers of sandy clay loam, loamy sand, and gravelly sandy clay loam and commonly has thin strata of other textures.

Camden soils have drainage similar to that of Alford and Proctor soils. They have more sand in the lower part of the B horizon and in the C horizon than Alford soils. They have a lighter colored surface layer that is lower in content of organic matter than Proctor soils.

Camden silt loam, 0 to 2 percent slopes (CaA).—This soil is on terraces along the major streams in the county. It has the profile described as representative for the series. Included in mapping are small areas of soils that have a more sandy subsoil than this Camden soil. Also included are a few small areas of soils that are somewhat poorly drained.

Limitations to use and management of this soil are slight. The soil is suited to all cultivated crops commonly grown in the county. It also can be used for permanent pasture and for trees. Capability unit I–1.

Camden silt loam, 2 to 6 percent slopes (CaB).—This soil is on terraces that generally are at the base of uplands. Included in mapping are small areas of soils that have a more sandy subsoil than this Camden soil, and a few small areas of soils that are moderately sloping.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

This soil is suited to all cultivated crops commonly grown in the county. It can also be used for permanent pasture and for trees. Capability unit IIe–3.

Cincinnati Series

The Cincinnati series consists of deep, well-drained, moderately sloping to strongly sloping soils on uplands. These soils formed in about 2 to 3 feet of loess and the underlying material weathered from glacial till. They have a very firm, brittle fragipan at a depth of about 2½ feet. The native vegetation was mainly mixed hardwood trees.

In a representative profile the surface layer is dark grayish-brown silt loam about 7 inches thick. The subsoil is thicker than 60 inches. The upper 20 inches of the subsoil is yellowish-brown, firm, strongly acid light silty clay loam, and the next 19 inches is a very firm and brittle fragipan. This fragipan is mottled yellowish brown and light brownish gray and is very strongly acid light silty clay loam that grades to light clay loam as depth increases. The lower part of the subsoil, to a depth of more than 118 inches, is mottled brown, yellowish-brown, and gray clay loam.

Cincinnati soils have moderate available water capacity and very slow permeability.

Representative profile of Cincinnati silt loam, 6 to 12 percent slopes, eroded, in a pasture at a point 280 feet east and 480 feet south of the northwest corner of NW¼ NE¼ sec. 26, T. 11 N., R. 8 W.:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam that has some splotches of yellowish brown (10YR 5/6); moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B21t—7 to 22 inches, yellowish-brown (10YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; firm; light yellowish-brown (10YR 6/4) silt coatings on some peds; strongly acid; clear, wavy boundary.

B22t—22 to 27 inches, yellowish-brown (10YR 5/6) silty clay loam; few, fine, faint, pale-brown (10YR 6/3) mottles; moderate, medium, subangular blocky structure; firm; thin, discontinuous, yellowish-brown (10YR 5/6) clay films on faces of peds; strongly acid; clear, wavy boundary.

IIBx1—27 to 39 inches, mottled yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) light silty clay loam that feels gritty; strong, coarse, prismatic structure; parting to weak, coarse, subangular blocky structure; very firm and brittle; thin, discontinuous, yellowish-brown (10YR 5/4) clay films on faces of prisms; thick light-gray (10YR 7/1) silt coatings as cappings on prisms and as fillings in krotovinas and some vertical crack fills; few, fine, very dark brown (10YR 2/2) iron and manganese oxide concretions and dark-brown (10YR 4/3) stains around concretions; few small pebbles; very strongly acid; gradual, wavy boundary.

IIBx2—39 to 46 inches, yellowish-brown (10YR 5/6) light clay loam; many, medium, distinct, light brownish-gray (10YR 6/2) mottles; strong, coarse, prismatic structure parting to weak, very thick, platy structure; very firm and brittle; thin, discontinuous, yellowish-brown (10YR 5/4) clay films on faces of prisms; thin to thick light-gray (10YR 6/1) silt coatings around prisms; common, medium, very dark brown (10YR 2/2) iron and manganese oxide concretions and brown (10YR 4/3) stains around concretions; few small pebbles; very strongly acid; gradual, wavy boundary.

IIB31—46 to 59 inches, mottled brown (10YR 5/3), yellowish-brown (10YR 5/6 and 10YR 5/8), and light brownish-gray (10YR 6/2) clay loam that has a high content of silt; weak, coarse, prismatic structure, but massive inside the peds; firm; thin, discontinuous, yellowish-brown (10YR 5/4) clay films on prisms; few, medium, very dark brown (10YR 2/2) iron and manganese oxide concretions and brown (10YR 4/3) stains around concretions; few small pebbles; strongly acid; gradual, wavy boundary.

IIB32—59 to 99 inches, yellowish-brown (10YR 5/6 and 10YR 5/8) clay loam that has a high content of silt; many, medium, distinct, gray (10YR 5/1) and light-gray (10YR 6/1) mottles; massive; firm; few, medium, very dark brown (10YR 2/2) concretions that have brown (10YR 4/3) stains around them; few small pebbles; medium acid; gradual, wavy boundary.

IIIB33g—99 to 118 inches, light-gray (10YR 6/1) clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; firm; many pebbles; medium acid.

Thickness of the loess cap ranges from 18 to 40 inches. The Ap horizon ranges from dark grayish brown to brown or grayish brown. A brown to yellowish-brown A2 horizon is present in some places that have been protected from erosion. Depth to the fragipan ranges from 22 to 32 inches. The fragipan ranges from 18 to 36 inches in thickness. It ranges from silty clay loam or silt loam in the upper part to clay loam in the lower part. The material underlying the fragipan ranges from loam to light silty clay loam or clay loam and from strongly acid in the upper part to mildly alkaline in the unleached till.

Cincinnati soils are associated with Hickory and Ava soils. In contrast to Hickory soils, Cincinnati soils have a fragipan. Also, they are leached to a greater depth than those soils and formed in a deeper deposit of loess. Cincinnati soils have better natural drainage than Ava soils.

Cincinnati silt loam, 6 to 12 percent slopes, eroded (CnC2).—This soil is on the sides of natural drainageways and below large level areas. It has the profile described as representative for the series. Included in mapping are small areas of Alford soils and a few areas of slightly eroded soils that are wooded or in permanent pasture.

Runoff, the risk of erosion, the very slowly permeable fragipan, and moderate available water capacity are limitations to the use and management of this soil. Crops are likely to be damaged during prolonged dry periods.

This soil is suited to most of the common crops in the county. Corn, soybeans, small grain, and meadow and pasture plants are the main crops. Alfalfa and other deep-rooted crops are not well suited, because the fragipan restricts the downward penetration of roots. Capability unit IIIe–7.

Cincinnati silt loam, 6 to 12 percent slopes, severely eroded (CnC3).—This soil is on the sides of natural drainageways and in areas at the heads of draws. It has a profile similar to the one described as representative for the series, except that erosion has removed most of the original surface layer and, in places, some of the subsoil. The plow layer consists mostly of yellowish-brown light silty clay loam from the subsoil and what remains of the original surface layer. The plow layer is lighter colored, lower in organic-matter content, and more difficult to plow than the original surface layer, and it is cloddy when dry. Numerous small gullies transect this soil. The fragipan is at a shallower depth than is typical for the series. Included in mapping are small areas of Cincinnati soils that have been deeply gullied by erosion and a few small areas of strongly sloping soils.

Runoff, the risk of erosion, the very slowly permeable fragipan, and moderate available water capacity are limitations to the use and management of this soil. Damage to crops is likely during prolonged dry periods. The severe hazard of erosion is a limitation to the use of this soil for row crops. This soil is suited to small grain and to meadow and pasture plants. Alfalfa and other deep-rooted crops are not well suited, because the fragipan restricts the downward penetration of roots. Capability unit IVe–7.

Cincinnati silt loam, 12 to 18 percent slopes, severely eroded (CnD3).—This soil is on sides of natural drainageways and below large level areas. It has a profile similar to the one described as representative for the series, except that the fragipan is at a shallower depth and is not so well formed. Also, erosion has removed most of the original surface layer and in places some of the subsoil. The plow layer is mostly yellowish-brown subsoil material that has a higher content of clay and a lower content of organic matter than the surface layer of the soil described as representative for the series. Included in mapping are small areas of deeply gullied Cincinnati soils.

Runoff, the risk of erosion, the very slowly permeable fragipan, and moderate available water capacity are limitations to the use and management of this soil. The severe hazard of erosion is a limitation to the use of this soil for row crops. During years of below average rainfall or poor rainfall distribution, crops are subject to damage from drought.

This soil is suited to meadow and pasture plants. Alfalfa and other deep-rooted crops are not well suited, because the fragipan restricts the downward penetration of roots. Christmas trees do well on this soil because they grow slowly and need little pruning. Capability unit VIe–1.

Cory Series

The Cory series consists of deep, somewhat poorly drained, nearly level soils on uplands. These soils formed in more than 6 feet of loess over glacial till. The native vegetation was prairie grasses and scattered hardwood trees.

In a representative profile the surface layer is very dark grayish-brown silt loam about 8 inches thick. The subsurface layer, about 7 inches thick, is light brownish-gray silt loam that is mottled with yellowish brown. The subsoil is about 30 inches thick. The upper part of the subsoil is mottled, light brownish-gray, friable silt loam that grades to firm silty clay loam and mottled, strong-brown, firm silty clay loam in the lower part. The underlying material is mostly mottled, yellowish-brown heavy silt loam, but at a depth of 75 inches, it grades to firm silt loam that feels gritty or to light clay loam.

Cory soils have high available water capacity and slow permeability.

Representative profile of Cory silt loam in a cultivated field at a point 240 feet west and 500 feet north of the southeast corner of SE¼NE¼ sec. 3, T. 10 N., R. 8 W.:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A2—8 to 15 inches, light brownish-gray (10YR 6/2) silt loam; many, fine and medium, distinct, yellowish-brown (10YR 5/4, 10YR 5/6) mottles; moderate, medium to thick, platy structure; friable; some dark grayish-brown (10YR 4/2) worm casts; few, fine, dark reddish-brown (5YR 2/2) iron and manganese concretions; medium acid; clear, wavy boundary.

B1g—15 to 19 inches, light brownish-gray (10YR 6/2) heavy silt loam; many, fine and medium, distinct, yellowish-brown (10YR 5/4, 10YR 5/6, 10YR 5/8) mottles; weak to moderate, medium, subangular blocky structure; friable; some dark grayish-brown (10YR 4/2) worm casts; few, fine, dark reddish-brown (5YR 2/2) iron and manganese concretions; medium acid; clear, wavy boundary.

B21tg—19 to 32 inches, light brownish-gray (10YR 6/2) silty clay loam; many, fine and medium, distinct, yellowish-brown (10YR 5/4, 10YR 5/6, 10YR 5/8) mottles; moderate, medium, prismatic structure parting to moderate, medium, angular blocky structure; firm; thin, continuous, dark-gray (10YR 4/1) and dark grayish-brown (10YR 4/2) clay films on most faces of peds and as coatings in root channels; few, fine and medium, black (10YR 2/1) iron and manganese concretions; medium acid; clear, wavy boundary.

B22tg—32 to 45 inches, mottled strong-brown (7.5YR 5/8), yellowish-brown (10YR 5/8), and light brownish-gray (10YR 6/2) silty clay loam; moderate, medium to coarse, prismatic structure parting to weak, coarse, subangular blocky structure; firm; thin, continuous, gray (10YR 5/1) clay films on faces of peds; dark-gray (10YR 4/1) coatings in root channels; few, fine to medium, black (10YR 2/1) iron and manganese concretions; medium acid; clear, wavy boundary.

C1—45 to 75 inches, yellowish-brown (10YR 5/6, 10YR 5/8) heavy silt loam; many, medium, distinct, light brownish-gray (10YR 6/2) mottles; massive; friable; dark-gray (10YR 4/1) coatings in root channels and krotovinas; few, fine and medium, black (10YR 2/1) iron and manganese concretions; slightly acid; gradual, wavy boundary.

IIC2—75 to 85 inches, yellowish-brown (10YR 5/6, 10YR 5/8) heavy silt loam to light clay loam; massive; firm; common, medium, black (10YR 2/1) iron and manganese concretions; many fine pebbles; neutral.

The thickness of the solum ranges from 36 to 60 inches but generally is 40 to 50 inches. The Ap horizon ranges from very dark grayish brown to very dark gray when moist and is grayish brown approaching light brownish gray when dry. The A2 horizon ranges from gray to light brownish gray and generally is mottled. The upper part of the B horizon, to a depth of 30 inches or more, is dominantly light brownish gray to gray and is mottled with brighter colors throughout. The B1g horizon ranges from silt loam to light silty clay loam. Reaction is strongly acid to medium acid. The C horizon is heavy silt loam in the upper part and grades to leached loam or clay loam glacial till material in the lower part. Where the C horizon is silt loam, it commonly contains enough sand to give it a gritty feel.

Cory soils are associated with Iva and Ragsdale soils. Their surface layer is darker colored and contains more organic matter than that of the Iva soils. Cory soils have better natural drainage, are more acid, and contain less organic matter than Ragsdale soils.

Cory silt loam (0 to 2 percent slopes) (Co).—This soil is on uplands. Included in mapping are a few areas of soils that have a dark-gray surface layer. Also included are a few areas of Iva silt loam and the more poorly drained Ragsdale silt loam.

Wetness is the major limitation to the use and management of this soil.

This soil is suited to corn, soybeans, small grain, and pasture plants if a suitable drainage system is established and maintained. Undrained areas can be used for permanent pasture and trees that are tolerant of wetness. Capability unit IIw–2.

Crane Series

The Crane series consists of deep, somewhat poorly drained, nearly level soils on terraces. These soils formed in a thin layer of loess and the underlying loamy glacial outwash under a native vegetation of tall prairie grasses. They are underlain by stratified layers of coarse sand to light sandy clay loam at depths ranging from 42 to 60 inches.

In a representative profile the surface layer is very dark grayish-brown silt loam about 12 inches thick. The subsoil, about 37 inches thick, is mottled, yellowish-brown, firm silty clay loam in the upper part and mottled, brown and yellowish-brown, firm clay loam that grades to sandy clay loam in the lower part. The underlying material is mottled, yellowish-brown, stratified layers of loamy sand and sand.

Crane soils have high available water capacity and moderate permeability.

Representative profile of Crane silt loam in a cultivated field at a point 860 feet east and 200 feet south from center of NE¼ sec. 9, T. 11 N., R. 9 W.:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam that feels gritty; weak, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

A12—8 to 12 inches, very dark grayish-brown (10YR 3/2) silt loam that feels gritty; moderate, medium, granular structure; friable; medium acid; clear, wavy boundary.

B21t—12 to 19 inches, yellowish-brown (10YR 5/6, 10YR 5/8) silty clay loam that feels gritty; common, fine, distinct, light brownish-gray (10YR 6/2) mottles; moderate, medium, subangular blocky structure; firm; few, thin, discontinuous, dark yellowish-brown (10YR 3/4) clay films on faces of peds; few very dark grayish-brown (10YR 3/2) iron and manganese concretions; medium acid; clear, wavy boundary.

IIB22t—19 to 38 inches, yellowish-brown (10YR 5/6) clay loam; many, medium, distinct, light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) mottles; moderate, medium, subangular blocky structure; firm; thick, continuous, very dark gray (10YR 3/1) clay films on faces of peds; few very dark grayish-brown (10YR 3/2) iron and manganese concretions; medium acid; clear, wavy boundary.

IIB3—38 to 49 inches, brown (10YR 5/3) and yellowish-brown (10YR 5/4) sandy clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, coarse, subangular blocky structure; friable; few very dark grayish-brown (10YR 3/2) iron and manganese concretions; medium acid; clear, wavy boundary.

IIC—49 to 70 inches, yellowish-brown (10YR 5/4) stratified layers of loamy sand and sand; common, medium, faint, brown (10YR 5/3) and grayish-brown (10YR 5/2) mottles; massive to single grained; loose; medium acid in upper part of horizon and neutral in lower part.

The thickness of the solum, and generally the depth to stratified sandy layers, ranges from 42 to 60 inches. The A horizon ranges from black to very dark brown or very dark grayish brown. The B horizon has dominant colors of yellowish brown to brown, and it always contains grayish mottles. The texture in the lower part of the B horizon ranges from heavy silt loam or silty clay loam containing a considerable amount of fine sand to clay loam or sandy clay loam containing more sand as depth increases. The B21 horizon is slightly acid to medium acid, and the IIB22t and IIB3 horizons are medium acid to strongly acid. The C horizon has stratified layers of sand, loamy sand, and sandy clay loam and thin strata of gravel. Reaction is medium acid in the upper part of the C horizon and typically becomes moderately alkaline with increasing depth.

The Crane soils are associated with the better drained Tippecanoe soils. They have a darker colored surface layer that contains more organic matter than the Whitaker soils, and their stratified underlying material is generally coarser textured.

Crane silt loam (0 to 2 percent slopes) (Cr).—This soil is nearly level or slightly depressional on terraces. Included in mapping are small areas of very poorly drained Tippecanoe soils.

Wetness is the major limitation to the use and management of this soil.

This soil is suited to all cultivated crops commonly grown in the county if an adequate drainage system is established and maintained. Meadow and pasture plants also can be grown. Capability unit IIw-2.

Eel Series

The Eel series consists of deep, moderately well drained, nearly level soils on bottom lands. These soils are in bands that parallel the river and other streams in the county. They formed in medium-textured alluvium under a native vegetation of mixed hardwood trees.

In a representative profile the surface layer is dark grayish-brown silt loam that feels gritty and is about 8 inches thick. The subsoil, about 33 inches thick, is brown and yellowish-brown, friable silt loam in the upper part and loam in the lower part. Grayish mottles are present in the lower two-thirds of the subsoil. The underlying material is light yellowish-brown and grayish-brown, stratified sand, silt loam, and light silty clay loam.

Eel soils have high available water capacity and moderate permeability. They are subject to flooding.

Representative profile of Eel silt loam, at a point 60 feet east and 100 feet north from the southwest corner of NW¼ sec. 4, T. 12 N., R. 9 W.:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B21—8 to 17 inches, brown (10YR 5/3) silt loam; weak, fine, subangular blocky structure; friable; neutral; clear, wavy boundary.

B22—17 to 34 inches, brown (10YR 5/3) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6, 10YR 5/8) and light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure; friable; neutral in upper part and mildly alkaline in lower part; clear, wavy boundary.

B3—34 to 41 inches, brown (10YR 5/3) loam; common, medium, distinct, yellowish-brown (10YR 5/6, 10YR 5/8) and light brownish-gray (10YR 6/2) mottles; weak, medium and coarse, subangular blocky structure; friable; mildly alkaline; abrupt, wavy boundary.

C—41 to 61 inches, stratified, light yellowish-brown (10YR 6/4) sand and grayish-brown (10YR 5/2) silt loam and light silty clay loam; common, fine, distinct, yellowish-brown (10YR 5/4, 10YR 5/6) and light olive-brown (2.5YR 5/4) mottles; single grained; friable to loose; mildly alkaline.

The Ap horizon ranges from dark grayish brown to brown. The Ap and B21 horizons commonly contain enough sand to give them a gritty feel. The B horizon ranges from dark brown to yellowish brown or pale brown. Grayish mottles are common within a depth of 2 feet. The B horizon typically is loam or silt loam, but in places it contains thin layers of sandy loam to light silty clay loam. It is mildly alkaline to slightly acid. The stratified underlying material ranges from light silty clay loam to sand.

Eel soils are associated with Genesee and Shoals soils. They are less well drained than Genesee soils and have better natural drainage than Shoals soils.

Eel silt loam (0 to 2 percent slopes) (Ee).—This soil is on bottom lands along the Wabash River and other streams throughout the county. Included in mapping are small areas of the well-drained Genesee soils and somewhat poorly drained Shoals soils.

Flooding is the major limitation to the use and management of this soil (fig. 11). Small grain and alfalfa are subject to damage from flooding in winter and early in spring.

This soil is suited to corn, soybeans, grain sorghum, and meadow and pasture plants. Capability unit I-2.

Elston Series

The Elston series consists of deep, well-drained, nearly level to gently sloping soils on terraces. These soils formed in sandy glacial outwash and medium sands that are underlain by deposits of gravel in places. The native vegetation was mainly prairie grasses.

In a representative profile the surface layer is about 20 inches of very dark brown sandy loam. The subsoil, about 52 inches thick, is dark-brown, very friable sandy loam in the upper part and grades to brown, very friable loamy sand and loose sand in the lower part. The underlying material is pale-brown fine and medium sand.

Elston soils have moderate to low available water capacity and moderate to moderately rapid permeability.

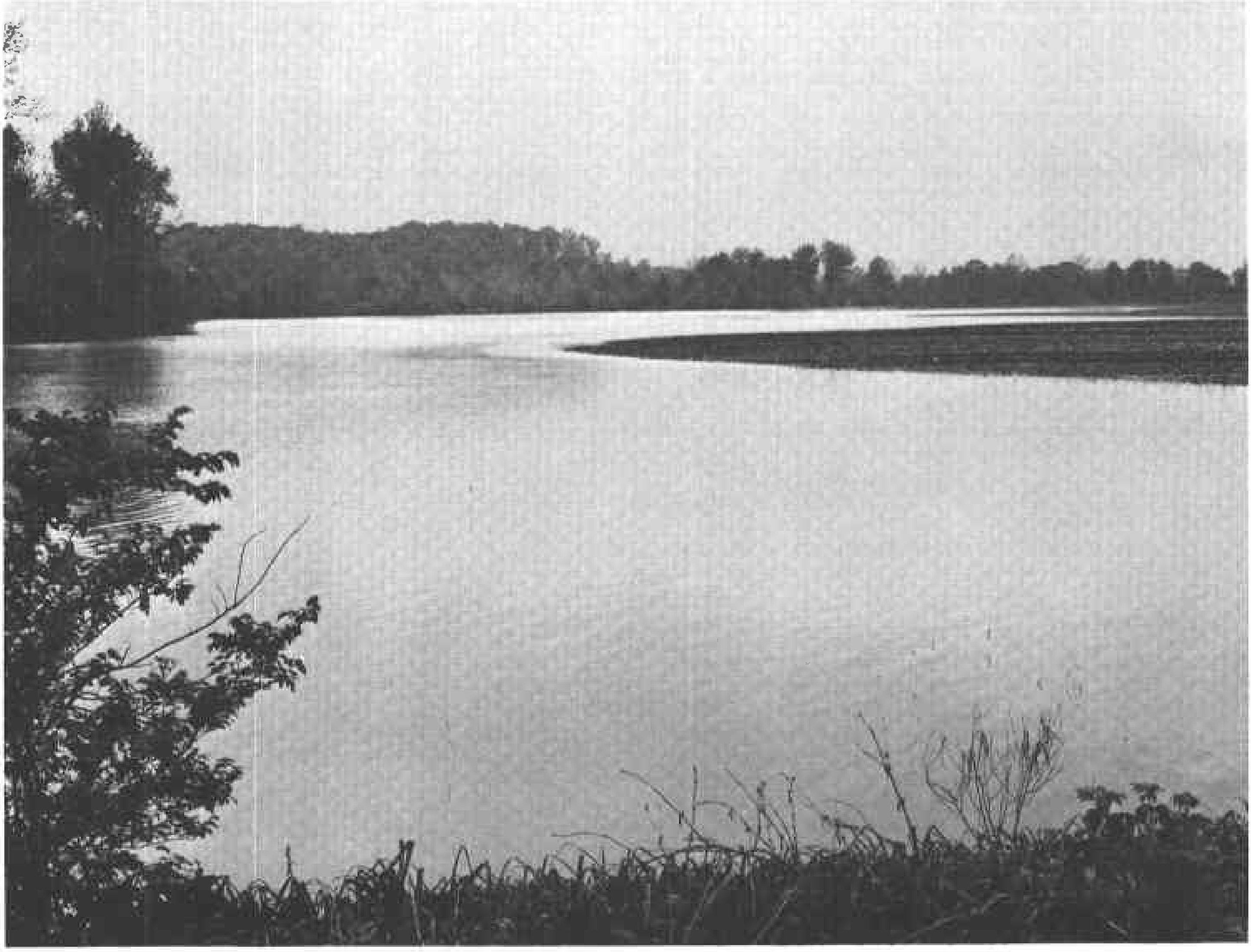


Figure 11.—**A flooded area of Eel silt loam. An unflooded area of Bartle silt loam is on low terrace at right side of picture.**

Representative profile of Elston sandy loam, 0 to 2 percent slopes, in an idle field at a point 1,300 feet east and 500 feet north of the center of sec. 14, T. 13 N., R. 9 W.:

Ap—0 to 10 inches, very dark brown (10YR 2/2) sandy loam, very dark grayish brown (10YR 3/2) crushed; weak, fine, granular structure; very friable; medium acid; abrupt, smooth boundary.

A12—10 to 20 inches, very dark brown (10YR 2/2) sandy loam; very dark grayish brown (10YR 3/2) crushed; weak, coarse, subangular blocky structure; friable; medium acid; gradual, wavy boundary.

B21t—20 to 34 inches, dark-brown (7.5YR 3/2) sandy loam, brown (7.5YR 4/2) crushed; weak, coarse, subangular blocky structure; very friable; thin, discontinuous, dark-brown (7.5YR 3/2) clay films on sand grains and bridging sand grains; few pebbles; medium acid; gradual, wavy boundary.

B22t—34 to 45 inches, brown (7.5YR 4/4) loamy sand; weak, coarse, subangular blocky structure; very friable; thin, discontinuous, dark-brown (7.5YR 3/2) clay films on sand grains and bridging sand grains; few pebbles; medium acid; gradual, wavy boundary.

B3—45 to 72 inches, brown (7.5YR 4/4) loamy sand to sand; single grained; loose; medium acid; clear, wavy boundary.

C—72 to 80 inches, pale-brown (10YR 6/3) fine and medium sand; single grained; loose; few pebbles; mildly alkaline and calcareous.

The A horizon ranges from black to very dark gray or very dark grayish brown. The B horizon ranges from dark reddish brown to dark yellowish brown. Texture ranges from loam to light sandy clay loam in the upper part of the B horizon to loamy sand and medium sand in the lower part. The underlying material is medium acid to neutral in the upper part and is mildly alkaline as depth increases. Some areas are underlain by calcareous, stratified sand and gravel below a depth of 5 to 6 feet.

Elston soils are associated with Ade and Warsaw soils. They have a continuous B horizon that is less sandy than that of Ade soils. Elston soils have a more sandy B horizon and are leached to a greater depth than Warsaw soils.

Elston sandy loam, 0 to 2 percent slopes (EIA).—This soil is on outwash terraces. It has the profile described as representative for the series. Included in mapping are small areas of soils that have a loamy sand surface layer and a few small areas of soils that have a loam surface layer. Also included are a few small areas of Ade soils.

The moderate to low available water capacity is a limitation to the use and management of this soil. In years of below-average rainfall or poor rainfall distribution, nonirrigated crops are subject to damage from drought.

This soil is suited to corn, soybeans, grain sorghum, small grain, and meadow and pasture plants. Irrigated vegetable crops, such as potatoes, tomatoes, and green beans, are well suited. Capability unit IIIs–2.

Elston sandy loam, 2 to 6 percent slopes (ElB).—This soil is on short breaks and in undulating areas on outwash terraces. Included in mapping are small areas of soils that have a loamy sand surface layer and a few small areas of Ade soils.

The risk of erosion and moderate to low available water capacity are limitations to the use and management of this soil.

This soil is suited to corn, soybeans, small grain, grain sorghum, and meadow and pasture plants. Irrigated vegetable crops, such as potatoes, tomatoes, and green beans, are well suited. During years of below-normal rainfall or poor rainfall distribution, nonirrigated crops are subject to damage from drought. Capability unit IIIe–13.

Fincastle Series

The Fincastle series consists of deep, somewhat poorly drained, nearly level soils on uplands. These soils formed in loess and the underlying glacial till. The mantle of loess over till is about 2 to 3 feet thick. The native vegetation was mainly mixed hardwood trees.

In a representative profile the surface layer is about 10 inches of grayish-brown silt loam. The subsoil, about 45 inches thick, is dark grayish-brown and yellowish-brown, firm silty clay loam and silt loam and is mottled with faint gray and dark yellowish brown in the upper part. The lower part is mottled brown, grayish-brown, and dark yellowish-brown, firm clay loam to loam. The underlying material is brown, calcareous loam till.

Fincastle soils have high available water capacity and slow permeability.

Representative profile of Fincastle silt loam in a cultivated field at a point 420 feet west and 75 feet south of the northeast corner of SE¼ sec. 11, T. 13 N., R. 10 W.:

Ap—0 to 10 inches, grayish-brown (10YR 5/2) silt loam; weak, fine, granular structure; friable; few, fine, black iron and manganese oxide concretions; strongly acid; abrupt, smooth boundary.

B1—10 to 12 inches, dark grayish-brown (10YR 4/2) silt loam; common, medium, faint, yellowish-brown (10YR 5/6) and light-gray (10YR 6/1) mottles; weak, medium, subangular blocky structure; friable; thin light-gray (10YR 7/1) silt coatings on faces of peds and as A2 remnants; few, fine, black (10YR 2/1) iron and manganese oxide concretions; medium acid; clear, wavy boundary.

B21t—12 to 30 inches, yellowish-brown (10YR 5/4) silty clay loam; common, fine, faint, gray (10YR 5/1) mottles; strong, medium, subangular blocky structure; firm; thin, continuous, gray (10YR 5/1) clay films on all peds; common black (10YR 2/1) iron and manganese oxide concretions; thin light-gray (10YR 7/1) silt coatings on faces of some peds; medium acid; clear, wavy boundary.

B22t—30 to 34 inches, yellowish-brown (10YR 5/6) heavy silt loam; many, medium, distinct, light-gray (10YR 6/1) mottles; weak, coarse, subangular blocky structure; friable; thin, continuous, gray (10YR 5/1) clay films on most faces of peds; common black (10YR 2/1) and reddish-brown (2.5YR 4/4) iron and manganese oxide segregations and concretions; medium acid; clear, wavy boundary.

IIB3t—34 to 55 inches, mottled brown (10YR 5/3), grayish-brown (10YR 5/2), and dark yellowish-brown (10YR 4/4) clay loam to loam; weak, coarse, prismatic structure parting to weak, coarse, subangular blocky structure; firm; thin, discontinuous, gray (10YR 5/1) clay films on prism faces; soft reddish-brown (2.4YR 4/4) iron and manganese oxide segregations; few fine pebbles; slightly acid; gradual, wavy boundary.

IIC—55 to 66 inches, brown (10YR 5/3) loam; massive; firm; 5 percent pebbles, a few as much as 2 inches in diameter; moderately alkaline and calcareous.

The thickness of the loess material ranges from 20 to 40 inches. The Ap horizon ranges in color from dark grayish brown to grayish brown. In some places there is an A2 horizon that ranges in color from light brownish gray to grayish brown. The upper part of the B horizon ranges from silt loam in the first few inches to light or medium silty clay loam as depth increases. The lower part, which formed in glacial till, ranges from silty clay loam that feels gritty to light or medium clay loam or loam. The B horizon ranges from pale brown through yellowish brown to brown and is mottled with light brownish gray to gray. Depth to carbonates ranges from about 40 to 60 inches.

Fincastle soils are associated with the better drained Xenia soils and have drainage similar to that of Reesville soils. They have a subsoil formed in loess and glacial till material, but Reesville soils formed entirely in loess.

Fincastle silt loam (0 to 2 percent slopes) (Fn).—This soil is on broad upland flats. Included in mapping are some small areas of soils that are slightly steeper and a few areas that have a thicker loess cover. Also included are small areas of the poorly drained Ragsdale soils.

Wetness is the major limitation to the use and management of this soil.

This soil is suited to all crops commonly grown in the county if an adequate drainage system is established and maintained. Capability unit IIw–2.

Fox Series

The Fox series consists of moderately deep, well-drained, nearly level to moderately sloping soils on terraces. These soils formed in loamy glacial outwash and are underlain by stratified, calcareous sand and gravel. The native vegetation was mixed hardwood trees.

In a representative profile the surface layer is about 8 inches of brown sandy loam. The subsoil, about 30 inches thick, is brown, firm gravelly clay loam. The underlying material is stratified, calcareous, loose sand and gravel.

Fox soils have low to moderate available water capacity. Permeability of the subsoil is moderate, but the gravelly underlying material has rapid permeability.

Representative profile of Fox sandy loam, 0 to 2 percent slopes, in a pasture field at a point 640 feet west and 60 feet north of the southeast corner of NE¼ sec. 29, T. 10 N., R. 10 W.:

Ap—0 to 8 inches, brown (10YR 4/3) sandy loam, dark yellowish brown (10YR 4/4) crushed; weak, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B21t—8 to 20 inches, brown (7.5YR 4/4) gravelly clay loam; moderate, medium, subangular blocky structure; firm; thin, continuous, dark-brown (7.5YR 3/2) clay films on faces of peds; 30 to 35 percent gravel; slightly acid; clear, wavy boundary.

B22t—20 to 29 inches, brown (7.5YR 4/4) gravelly clay loam; weak, medium and coarse, subangular blocky structure; firm; thin, continuous, dark-brown (7.5YR 3/2) clay films on faces of peds; 30 percent gravel; medium acid; clear, wavy boundary.

B3—29 to 38 inches, brown (7.5YR 4/4) gravelly clay loam; weak, coarse, subangular blocky structure; firm; 20 to 30 percent gravel containing cobblestones as much as 4 inches in diameter; thin, discontinuous, dark-brown (7.5YR 3/2) clay films on faces of peds; contains a 2- to 3-inch stone line that is predominantly sandstone in lower part of horizon; this horizon is distinctly tongued into the underlying horizon; medium acid; abrupt, irregular boundary.

IIC—38 to 62 inches, brown (10YR 5/3), yellowish-brown (10YR 5/4), and pale-brown (10YR 6/3) sand and gravel; single grained; loose; moderately alkaline and calcareous.

The Ap horizon ranges from dark grayish brown to brown. The B horizon ranges from sandy clay loam to gravelly loam or gravelly clay loam. The thickness and frequency of the tongues extending into the underlying material are variable. Because of the tonguing, the depth to the gravelly underlying material ranges from 24 to 48 inches or more.

Fox soils are associated with Elston and Warsaw soils. They have a lighter colored surface layer that contains less organic matter and they contain more clay and gravel in the subsoil than Elston soils. Also, their solum formed directly over stratified gravel and sand. Fox soils contain less organic matter in the Ap horizon and are lighter colored than Warsaw soils.

Fox sandy loam, 0 to 2 percent slopes (FoA).—This soil is on broad terraces. It has the profile described as representative for the series. Included in mapping are a few areas of Fox soils that have a loam surface layer.

The low to moderate available water capacity is a limitation to the use and management of this soil.

This soil is suited to small grain that is planted in fall. Corn should be planted as early as possible to prevent damage from drought. Grain sorghum commonly is planted because it can withstand drought better than corn. Irrigated vegetable crops, such as potatoes, tomatoes, and green beans, also are suited. Capability unit IIIs–2.

Fox sandy loam, 2 to 6 percent slopes, eroded (FoB2).—This soil is mainly along drainageways and in long, narrow strips above terrace breaks or escarpments. Slopes are short. It has a profile similar to the one described for the series, except that the surface layer is thinner. The present plow layer is a mixture of the original surface layer and a moderate amount of the subsoil. Included in mapping are a few small areas of Fox soils that have a loam surface layer. Also included are some spots of soils that are more eroded than this Fox soil, and their present surface layer is mainly subsoil material. In places these included soils have gravel on the surface. Other inclusions are a few small areas of soils that are not eroded or are only slightly eroded.

The risk of erosion and the low to moderate available water capacity are limitations to the use and management of this soil.

This soil is suited to fall-seeded small grain. Corn should be planted as early as possible to prevent damage from drought. Grain sorghum commonly is planted because it can withstand drought better than corn. Irrigated vegetable crops, such as potatoes, tomatoes, and green beans, also are suited. Capability unit IIIe–13.

Fox clay loam, 6 to 12 percent slopes, severely eroded (FxC3).—This soil is along drainageways and breaks of terraces. It has a profile similar to that described for the series but has lost from 6 inches to all of its original surface layer through erosion. The present plow layer of clay loam is subsoil material that has been mixed with the remaining part of the original surface layer through tillage. Numerous small gullies transect this soil in places. Included in mapping are a few areas of soils that are more strongly sloping. Also included are small spots of very gravelly soils and a few small areas of less eroded soils.

The risk of erosion and the low to moderate available water capacity are limitations to the use and management of this soil.

This soil is better suited to meadow and pasture plants than to most other crops. Capability unit IVe–13.

Genesee Series

The Genesee series consists of deep, well-drained, nearly level soils on bottom lands. These soils formed in medium-textured alluvium under a native vegetative cover of mixed hardwood trees.

In a representative profile the surface layer is about 9 inches of dark grayish-brown silt loam. The subsoil is friable, neutral, and about 25 inches thick. It is brown silt loam in the upper part and dark yellowish-brown loam in the lower part. The underlying material is yellowish-brown, stratified loam, fine sandy loam, and silt loam.

Genesee soils have high available water capacity and moderate permeability. These soils are subject to flooding.

Representative profile of Genesee silt loam in a cultivated field at a point 1,860 feet north and 930 feet west of the southeast corner of sec. 1, T. 10 N., R. 11 W.:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

B21—9 to 14 inches, brown (10YR 4/3) silt loam; moderate, fine and medium, subangular blocky structure; friable; neutral; clear, smooth boundary.

B22—14 to 23 inches, brown (10YR 4/3) silt loam to loam; moderate, medium, subangular blocky structure; friable; neutral; gradual, smooth boundary.

B23—23 to 34 inches, dark yellowish-brown (10YR 4/4) loam; weak, medium, subangular blocky structure; friable; neutral; gradual, smooth boundary.

C—34 to 72 inches, yellowish-brown (10YR 5/4) stratified loam, fine sandy loam, and silt loam; massive; friable; mildly alkaline and calcareous.

The Ap horizon ranges from dark grayish brown to brown in color and from silt loam to fine sandy loam in texture. The Ap, B21, and B22 horizons contain enough sand to give them a gritty feel. The B horizon ranges from brown to dark yellowish brown. It generally ranges from silt loam to loam, but in some places it ranges to light silty clay loam, clay loam, or sandy loam. Reaction ranges from slightly acid to mildly alkaline. The underlying material is typically stratified and ranges from silt loam and loam to fine sandy loam that contains thin layers of light silty clay loam to sand. Reaction is mildly alkaline to moderately alkaline.

Genesee soils are associated with Armiesburg and Eel soils. They have a lighter colored surface layer and contain more sand in the A and B horizons than Armiesburg soils. Genesee soils have better natural drainage than Eel soils, which contain grayish mottles at a depth above 24 inches.

Genesee silt loam (0 to 2 percent slopes) (Ge).—This soil is on broad bottom lands. Included in mapping are small areas of moderately well drained soils in drainageways. Also included are a few areas of soils that do not contain free carbonates at a depth above 40 inches and some small areas of soils that have a loam surface layer.

Flooding between the months of December and June is the major limitation to the use and management of this soil. Some areas are protected by levees, but seepage and runoff can cause some flooding in these areas during periods of prolonged, heavy rainfall.

This soil is better suited to corn than to most other crops, because it can be planted and harvested during the period of least flooding. Alfalfa and small grain are subject to severe damage during periods of prolonged flooding. Capability unit I–2.

Genesee Series, Sandy Variant

The Genesee series, sandy variant, consists of deep, well-drained, nearly level soils on bottom lands. These soils formed in moderately coarse textured alluvium under native vegetation of mixed hardwood trees.

In a representative profile the surface layer is about 8 inches of brown fine sandy loam. The subsurface layer is about 5 inches of dark yellowish-brown fine sandy loam. The subsoil, about 22 inches thick, is brown loam in the upper part, dark yellowish-brown fine sandy loam in the middle part, and brown loamy sand in the lower part. It is neutral to mildly alkaline. The underlying material is pale-brown, moderately alkaline fine sandy loam in the upper part and brown, moderately alkaline, stratified fine sandy loam and loamy sand in the lower part.

Genesee, sandy variant, soils have moderate available water capacity and moderate permeability. These soils are subject to flooding.

Representative profile of Genesee fine sandy loam, sandy variant, in an idle field at a point 220 feet west and 60 feet south of the northeast corner of SE¼NE¼ sec. 36, T. 13 N., R. 9 W.:

Ap—0 to 8 inches, brown (10YR 4/3) fine sandy loam; weak, medium, granular structure; very friable; neutral; abrupt, smooth boundary.

A2—8 to 13 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, medium, granular structure; friable; neutral; abrupt, wavy boundary.

B21—13 to 20 inches, brown (10YR 4/3) loam; weak, medium, subangular blocky structure parting to moderate, medium, granular structure; friable; neutral; clear, wavy boundary.

B22—20 to 25 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, medium, subangular blocky structure parting to weak, medium, granular structure; friable; neutral; clear, wavy boundary.

B3—25 to 35 inches, brown (10YR 5/3) loamy sand; weak, medium and coarse, subangular blocky structure to single grained; very friable; mildly alkaline; abrupt, wavy boundary.

C1—35 to 50 inches, pale-brown (10YR 6/3) fine sand; single grained; loose; moderately alkaline; clear, wavy boundary.

C2—50 to 80 inches, brown (10YR 4/3, 10YR 5/3) stratified fine sandy loam and loamy sand; massive to single grained; very friable to loose; moderately alkaline.

The Ap horizon ranges from dark grayish brown to brown. The B horizon ranges from brown to dark yellowish brown and from loam to loamy sand. The average content of clay is less than 18 percent. Reaction ranges from slightly acid to mildly alkaline. The underlying material is stratified and ranges from fine sand to layers of loam or sandy loam. Reaction is mildly alkaline to moderately alkaline.

Genesee, sandy variant, soils are associated with Eel and Genesee soils. They have a lower content of clay than those soils and are naturally better drained than Eel soils.

Genesee fine sandy loam, sandy variant (0 to 2 percent slopes) (Gf).—This soil is on bottom lands adjacent to the Wabash River and other major streams in the county. Included in mapping are small areas of Genesee soils that have a loam surface layer. Also included are a few sand and gravel bars that are adjacent to the river. These areas are identified on the soil map by symbols for sand spots and gravel spots.

This soil is suited to corn, soybeans, grain sorghum, and meadow and pasture plants. Small grain and alfalfa are subject to damage from flooding in winter and early in spring.

Flooding is a major limitation to the use and management of this soil for most town and country planning purposes. Capability unit I–2.

Gravel Pits

Gravel pits (Gp) consist of areas where gravel and sand have been removed. Most of these pits are on terraces along the Wabash River. The pits are mostly 40 to 80 acres in size but range from about 2 acres to 350 acres. Gravel pits are mainly in areas of Warsaw, Elston, and other outwash soils. Many of these pits have had gravel removed to a depth below the water table and are now filled with water, providing a potential for fishing and other recreational uses. Gravel pits also make good wildlife areas, especially for upland game birds. The sides of gravel pits generally are steep and subject to severe erosion. Exposed sides can erode and add sediment to the water areas. A permanent vegetative cover helps to control erosion and sedimentation. Capability unit VIIe–3.

Hennepin Series

The Hennepin series consists of deep, well-drained, very steep soils on uplands. These soils formed in loam glacial till under a native vegetation of mixed hardwoods.

In a representative profile the surface layer is about 6 inches of dark grayish-brown loam. The subsoil, about 10 inches thick, is dark yellowish-brown, firm light clay loam. The underlying material is brown, friable, calcareous loam till.

Hennepin soils have moderate available water capacity and moderate permeability.

Representative profile of Hennepin loam, 25 to 50 percent slopes, in a wooded area at a point 600 feet west and 140 feet north of the northeast corner of SE¼NW¼ sec. 1, T. 13 N., R. 10 W.:

A1—0 to 6 inches, dark grayish-brown (10YR 4/2) loam; moderate, medium, granular structure; friable; slightly acid; clear, wavy boundary.

B—6 to 16 inches, dark yellowish-brown (10YR 4/4) light clay loam; moderate, medium, subangular blocky structure; firm; neutral ! clear, wavy boundary.

C—16 to 60 inches, brown (10YR 5/3) loam; massive; friable; many pebbles and rock fragments; moderately alkaline, calcareous, and strongly effervescent.

The A horizon is dark grayish brown or grayish brown. The B horizon ranges from brown to dark yellowish brown and from silt loam to light clay loam or loam. This horizon ranges from about 5 to 12 inches in thickness and from slightly acid to moderately alkaline in reaction. The underlying material ranges from calcareous loam to light clay loam till.

The Hennepin soils have drainage similar to that of the Hickory soils. They have a thinner solum and are shallower to carbonates than Hickory soils.

Hennepin loam, 25 to 50 percent slopes (HeG).—This soil is immediately below ridges or large areas of nearly level to gently sloping soils. It also is on escarpments and short breaks along the major streams. Included in mapping are small areas of more eroded soils. Also included is one area, just west of the bottom lands along the Wabash River, that has rock outcrops at the base of some of the slopes.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

This soil is too steep for cultivated crops. Permanent pasture plants can be grown in some places on the lesser slopes, but careful management is needed to control erosion. This soil is better suited to hardwood trees growing in mixed stands than it is to other uses. Capability unit VIIe–2.

Hickory Series

The Hickory series consists of deep, well-drained, moderately steep to very steep soils on uplands. These soils formed in 0 to 18 inches of loess and the underlying glacial till. The native vegetation was mainly mixed hardwood trees.

In a representative profile the surface layer is about 11 inches of loam. It is dark grayish brown in the upper part and brown in the lower part. The subsoil, about 37 inches thick, is yellowish-brown, friable loam that grades to firm sandy clay loam in the upper part and clay loam that grades to loam in the lower part. The underlying material is brown, calcareous loam that contains many pebbles and small rocks.

Hickory soils have high available water capacity and moderate permeability.

Representative profile of Hickory loam, 25 to 40 percent slopes, in a wooded area at a point 560 feet east and 240 feet south of the center of SW¼ sec. 26, T. 12 N., R. 10 W.:

AO—½ inch to 0, leaf litter.

A1—0 to 1 inch, dark grayish-brown (10YR 4/2) loam; moderate, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—1 to 11 inches, brown (10YR 5/3) loam; weak, thick, platy structure parting to moderate, medium, granular structure; friable; very strongly acid; clear, smooth boundary.

B1—11 to 19 inches, yellowish-brown (10YR 5/4) loam; weak, medium, subangular blocky structure; friable; medium acid; clear, wavy boundary.

B21t—19 to 28 inches, yellowish-brown (10YR 5/6) sandy clay loam; moderate, medium, subangular blocky structure; firm; few pebbles; thin, continuous, brown (7.5YR 4/4) clay films on faces of peds; medium acid; gradual, wavy boundary.

B22t—28 to 44 inches, yellowish-brown (10YR 5/6) clay loam; moderate, medium, subangular blocky structure; firm; thin, continuous, brown (7.5YR 4/4) clay films on faces of peds; few pebbles; strongly acid; gradual, wavy boundary.

B3t—44 to 48 inches, yellowish-brown (10YR 5/6) loam; weak, coarse, subangular blocky structure; firm; thin, discontinuous, brown (7.5YR 4/4) clay films on faces of peds; few pebbles; mildly alkaline; gradual, wavy boundary.

C—48 to 60 inches, brown (10YR 5/3) loam; massive; firm; about 10 percent pebbles; moderately alkaline and calcareous.

The A1 horizon is less than 5 inches in thickness and ranges from very dark grayish brown or very dark gray to dark grayish brown in color. In some cultivated areas the Ap horizon ranges from dark grayish brown to yellowish brown. The B horizon is predominantly clay loam, but it ranges from loam to silty clay loam that feels grity. The thickness of the B horizon ranges from about 3 to 5 feet. Reaction in the B1 and B2 horizons is medium acid to strongly acid. The underlying material ranges from loam to clay loam.

Hickory soils have drainage similar to that of Cincinnati and Hennepin soils. They lack a fragipan, which is a characteristic of Cincinnati soils. They are leached to a greater depth and have a thicker B horizon than Hennepin soils.

Hickory loam, 18 to 25 percent slopes (HkE).—This soil is in natural drainageways. Slopes are short and irregular. This soil has a profile similar to the one described as representative for the series, except that it is leached to a slightly greater depth. Included in mapping are small areas of more severely eroded soils and some areas of soils that have a silt loam surface layer. Also included are small areas of Alford, Negley, and Princeton soils.

Runoff and the risk of erosion are the major limitations to the use and management of this soil. This soil is suited to permanent pasture and woods. Capability unit VIe–1.

Hickory loam, 25 to 40 percent slopes (HkF).—This soil is in natural drainageways and on escarpments. It has the profile described as representative for the series. Slopes are short and irregular. Included in mapping are areas of soils that have a silt loam surface layer and small areas of soils that are more eroded than this Hickory soil. Also included are small areas of Alford, Negley, and Princeton soils.

Runoff and the risk of erosion are major limitations to the use and management of this soil. Most of this soil is in trees, to which it is suited. Where slopes are between 25 and 30 percent, the soil is suited to pasture if it is properly managed. Capability unit VIIe–1.

Iva Series

The Iva series consists of deep, somewhat poorly drained, nearly level to gently sloping soils on uplands. These soils formed in more than 6 feet of loess under a native vegetative cover of mixed hardwood trees.

In a representative profile the surface layer is about 11 inches of silt loam. The upper 8 inches is grayish brown, and the lower part is light brownish gray and has yellowish-brown mottles. The subsoil is about 44 inches thick. It is mottled, dark grayish-brown and yellowish-brown, firm light silty clay loam in the upper part, and it grades to mottled yellowish-brown and light brownish-gray, friable heavy silt loam in the lower part. The upper part is strongly acid, and the lower part is slightly acid. The underlying material is mottled yellowish-brown and light brownish-gray silt loam that grades from slightly acid to neutral below a depth of 6 feet.

Iva soils have high available water capacity and slow permeability.

Representative profile of Iva silt loam, 0 to 2 percent slopes, in a meadow at a point 600 feet west and 900 feet north of the southeast corner of NE¼ sec. 29, T. 11 N., R. 8 W.:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; moderate, fine and medium, granular structure; friable; neutral; abrupt, smooth boundary.

A2—8 to 11 inches, light brownish-gray (10YR 6/2) silt loam; common, fine, distinct, yellowish-brown (10YR 5/4) mottles; weak to moderate, thick, platy structure; friable; few, thin, light-gray (10YR 7/2) silt coatings on faces of peds; neutral; clear, wavy boundary.

B1g—11 to 14 inches, dark grayish-brown (10YR 4/2) light silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/4) and light brownish-gray (10YR 6/2) mottles; moderate, medium and fine, subangular blocky structure; firm; few, thin, light-gray (10YR 7/2) silt coatings on faces of peds; few, small, very dusky red (2.5YR 2/2) iron and manganese oxide concretions; medium acid; clear, wavy boundary.

B21tg—14 to 28 inches, yellowish-brown (10YR 5/4, 10YR 5/6) light silty clay loam; many, medium, distinct, light brownish-gray (10YR 6/2) mottles; moderate, medium, subangular blocky structure becoming coarser with depth; firm; few, thin, light-gray (10YR 7/2) silt coatings that tend to disappear on wetting; thin, discontinuous, light brownish-gray (10YR 6/2) clay films on faces of peds and in root channels; strongly acid; gradual, wavy boundary.

B22tg—28 to 38 inches, yellowish-brown (10YR 5/4, 10YR 5/6) light silty clay loam; many, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, coarse, subangular blocky structure; firm; thin, discontinuous, light brownish-gray (10YR 6/2) clay films on faces of peds and in root channels; few, thin, light-gray (10YR 7/2) silt coatings that tend to disappear on wetting; few, small, very dusky red (2.5YR 2/2) iron and manganese oxide concretions; medium acid; gradual, wavy boundary.

B3—38 to 55 inches, mottled yellowish-brown (10YR 5/4) and light brownish-gray (10YR 6/2) heavy silt loam; weak, coarse, subangular blocky structure; friable; few, medium, very dusky red (2.5YR 2/2) iron and manganese oxide concretions; slightly acid; gradual, wavy boundary.

C55 to 80 inches, mottled light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/4) silt loam; massive; friable; few, medium, very dusky red (2.5 YR 2/2) iron and manganese oxide concretions; slightly acid in upper part, becoming neutral as depth increases.

Thickness of the solum ranges from 36 to 60 inches. The Ap horizon ranges from dark grayish brown to grayish brown. The A2 horizon ranges from light brownish gray to grayish brown. Depth to mottling ranges from 6 to 15 inches. The B2 horizon is silt loam to light silty clay loam and is strongly acid to medium acid. The underlying material is silt loam or silt and is medium acid to slightly acid. In some places the C horizon is mildly alkaline below a depth of 6 feet.

Iva soils have drainage similar to that of Cory and Reesville soils. They have a lighter colored surface layer that is lower in organic-matter content than Cory soils. Iva soils are more acid, lower in bases, and leached to a greater depth than Reesville soils. Also, their solum generally is thicker than that of Reesville soils.

Iva silt loam, 0 to 2 percent slopes (IvA).—This soil is in broad areas on uplands. It has the profile described as representative for the series. Included in mapping are small areas of gently sloping soils along the upper reaches of drainageways and some small areas of Reesville and Cory soils.

Wetness is the major limitation to the use and management of this soil.

This soil is suited to corn, soybeans, small grain, and meadow and pasture plants if a suitable drainage system is established and maintained. Capability unit IIw–2.

Iva silt loam, 2 to 4 percent slopes (IvB).—This soil is adjacent to drainageways. Included with it in mapping are small areas of moderately eroded soils and a few small areas of moderately well drained soils.

Wetness and the risk of erosion are the major limitations to the use and management of this soil.

This soil is suited to corn, soybeans, and small grain if a suitable drainage system and erosion control practices are established and maintained. It also can be used for meadow or permanent pasture and for trees that are tolerant of wetness. Capability unit IIw–2.

Made Land

Made land (Ma) consists of areas that have been greatly altered by man. Among these are Gravel pits and Borrow pits that have been filled and leveled and deep natural depressions or areas that have been covered by deposits of rubble.

In places Made land is used for building sites or industrial uses. The variability of these areas is too great to make accurate predictions on their behavior for specific uses. For instance, one area may be filled with material from an old road surface, and another area may be a sanitary landfill. Therefore, it is important that each area mapped as Made land be thoroughly investigated before it is used. Capability unit VIIe–3.

Millsdale Series

The Millsdale series consists of moderately deep, very poorly drained, nearly level to depressional soils on rock-cut terraces. These soils formed in 20 to 40 inches of loess or glacial drift and residuum from limestone bedrock. The native vegetation was forest mixed with swamp grasses and sedges.

In a representative profile the surface layer is 18 inches of silty clay loam that is very dark gray grading to black. The subsoil, about 18 inches thick, is firm heavy silty clay loam that is olive gray grading to gray and is mottled with yellowish brown and shades of olive. The underlying material is hard, level-bedded limestone bedrock.

Millsdale soils have low to moderate available water capacity and slow permeability. They are subject to ponding.

Representative profile of Millsdale silty clay loam in a pasture field at a point 320 feet east and 740 feet north of the center of sec. 36, T. 12 N., R. 10 W.:

Ap—0 to 8 inches, very dark gray (10YR 3/1) silty clay loam; weak, fine, subangular blocky structure; firm; neutral; abrupt, smooth boundary.

A1—8 to 18 inches, black (10YR 2/1) heavy silty clay loam; moderate, fine, angular blocky structure; firm; neutral; clear, wavy boundary.

B21tg—18 to 26 inches, olive-gray (5YR 5/2) heavy silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/4, 10YR 5/6) and light olive-brown (2.5YR 5/6) mottles; moderate, medium, subangular and angular blocky structure; thin, discontinuous, dark-gray (10YR 4/1) clay films on faces of peds; few, fine, black (10YR 2/1) iron and manganese oxide concretions; few pebbles; neutral; clear, wavy boundary.

B22tg—26 to 36 inches, gray (5YR 5/1) heavy silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/4, 10YR 5/6), light olive-brown (2.5YR 5/6), and olive (5Y 5/4) mottles; moderate, medium and coarse, subangular blocky structure; firm; thin, discontinuous, dark-gray (10YR 4/1) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide concretions; few limestone fragments (approximately 10 percent); mildly alkaline and noncalcareous; abrupt, irregular boundary.

IIR—36 to 60 inches, hard, level-bedded limestone bedrock.

The thickness of the solum and the depth to bedrock range from 24 to 40 inches. The Ap horizon is very dark gray to black. The B horizon is heavy silty clay loam or clay loam. In some places a thin layer of silty clay is adjacent to the limestone bedrock.

Millsdale soils are associated with Randolph soils. They are more poorly drained than those soils and have a darker colored surface layer that is higher in organic-matter content.

Millsdale silty clay loam (0 to 2 percent slopes) (Md).—This soil is on nearly level to slightly depressional terraces cut in bedrock. Included in mapping are a few areas of somewhat poorly drained Randolph soils and few small areas of soils that are less than 20 inches deep to bedrock.

Wetness, ponding, and the shallow depth to bedrock are the major limitations to the use and management of this soil.

This soil is suited to corn, soybeans, small grain, and grasses and legumes if it is adequately drained. Seepy and undrained areas are commonly used for pasture and woodlots. Capability unit IIIw–5.

Muren Series

The Muren series consists of deep, moderately well drained, nearly level to gently sloping soils on uplands. These soils formed in more than 6 feet of loess under a native vegetative cover of mixed hardwoods.

In a representative profile the surface layer is about 7 inches of dark grayish-brown silt loam. The subsoil is about 46 inhces thick. The upper part of the subsoil is yellowish-brown, firm light silty clay loam; the middle part is yellowish-brown, firm silty clay loam that is mottled with light brownish gray; and the lower part is yellowish-brown light silty clay loam grading to heavy silt loam that is mottled with light brownish gray. The underlying material is light brownish-gray silt loam that is mottled with yellowish brown.

Muren soils have high available water capacity and moderately slow permeability.

Representative profile of Muren silt loam, 2 to 6 percent slopes, eroded, in a clover field at a point 100 feet east and 80 feet north of the center of sec. 4, T. 10 N., R. 9 W.:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B21t—7 to 13 inches, yellowish-brown (10YR 5/4) light silty clay loam; moderate, fine, subangular blocky structure; firm; thin, discontinuous, brown (10YR 4/3) clay films on some peds; medium acid; clear, wavy boundary.

B22t—13 to 18 inches, yellowish-brown (10YR 5/4, 10YR 5/6) silty clay loam; few, fine, distinct, light brownish-gray (10YR 6/2) mottles; moderate, fine and medium, subangular blocky structure; firm; thin, discontinuous, brown (10YR 4/3) clay films on peds; few, fine, black (10YR 2/1) iron and manganese concretions; strongly acid; clear, wavy boundary.

B23t—18 to 36 inches, yellowish-brown (10YR 5/4, 10YR 5/6) silty clay loam; common, fine, distinct, light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) mottles; moderate, medium and coarse, subangular blocky structure; firm; thin, discontinuous, brown (10YR 5/3) clay films on peds; thin, discontinuous, light-gray (10YR 7/2) silt coatings on some peds; common black (10YR 2/1) iron and manganese concretions; strongly acid; clear, wavy boundary.

B24t—36 to 43 inches, light yellowish-brown (10YR 6/4) and yellowish-brown (10YR 5/4, 10YR 5/6) light silty clay loam; common, fine and medium, distinct, light brownish-gray (10YR 6/2) mottles; weak to moderate, coarse, subangular blocky structure; firm; thin, discontinuous, brown (10YR 5/3) clay films on peds; thin, discontinuous, light-gray (10YR 7/2) silt coats on some peds; common black (10YR 2/1) iron and manganese concretions; medium acid; gradual, wavy boundary.

B3—43 to 53 inches, yellowish-brown (10YR 5/6, 10YR 5/8) light silty clay loam grading to heavy silt loam; common, medium, distinct, light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) mottles; weak, coarse, subangular blocky structure; friable; few black (10YR 2/1) iron and manganese concretions; slightly acid; gradual, wavy boundary.

C—53 to 90 inches, light brownish-gray (10YR 6/2, 2.5YR 6/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6, 10YR 5/8) mottles; massive; friable; few black (10YR 2/1) iron and manganese concretions; slightly acid in upper part of horizon and neutral in lower part.

The thickness of the solum ranges from about 40 to 60 inches. The Ap horizon ranges from dark grayish brown to dark yellowish brown or brown. An A2 horizon that is brown or yellowish brown is present in some places. The B2 horizon ranges from dark yellowish brown to light yellowish brown and is mottled with shades of gray at a depth of 10 to 20 inches. It ranges from heavy silt loam to silty clay loam in texture. The C horizon is silt loam or silt and is strongly acid to slightly acid in the upper part but in places grades to neutral below a depth of 6 feet.

Muren soils are associated with Iva and Reesville soils. They are naturally better drained than those soils and are leached to a greater depth than Reesville soils.

Muren silt loam, 0 to 2 percent slopes (MuA).—This soil is on ridgetops or in areas adjacent to sharp breaks in the landscape. It has a profile similar to the one described as representative for the series, except that it has a slightly thicker surface layer and silty clay loam is at a greater depth. Included in mapping are a few small areas of Alford soils and a few small areas of somewhat poorly drained Iva and Reesville soils.

This soil has few limitations to use and management for farming. It is suited to all crops commonly grown in county. Capability unit I–1.

Muren silt loam, 2 to 6 percent slopes, eroded (MuB2).—This soil is on narrow ridgetops and along natural draws. It has the profile described as representative for the series. In some places the yellowish-brown silty clay loam subsoil has been exposed by erosion. Included in mapping are areas of soils that are only slightly eroded. Also included are few small areas of somewhat poorly drained Reesville soils and few areas that are less acid in the lower part of the subsoil and in the underlying material.

Runoff and the risk of erosion are the major limitations to the use and management of this soil. The soil is suited to all crops commonly grown in the county, including orchard crops. Capability unit IIe–3.

Negley Series

The Negley series consists of deep, well-drained, moderately steep to very steep soils on uplands. These soils formed in weathered, acid loam to sandy loam outwash material. The native vegetation was mixed hardwood trees.

In a representative profile the surface layer is about 6 inches of loam. The upper 2 inches is very dark grayish brown, and the lower part is brown. The subsoil is about 75 inches thick. The upper few inches is dark-brown, friable sandy clay loam; the middle part is dark-red, firm clay loam that grades to reddish-brown, friable sandy clay loam; and the lower part is yellowish-red, friable light sandy clay loam. The underlying material is dark-brown, stratified sand and loamy sand.

Negley soils have high available water capacity and moderate permeability.

Representative profile of Negley loam, 25 to 40 percent slopes, in a wooded area at a point 400 feet south and 60 feet west from the northeast corner of sec. 2, T. 12 N., R. 8 W.:

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—2 to 6 inches, brown (10YR 5/3) loam; weak, thick, platy structure parting to moderate, medium, granular structure; friable; medium acid; clear, wavy boundary.

B1—6 to 15 inches, brown (7.5YR 4/4) sandy clay loam; moderate, fine, subangular blocky structure; friable; thin, discontinuous, brown (10YR 5/3) coatings on peds; strongly acid; clear, wavy boundary.

B21—15 to 30 inches, dark-red (2.5YR 3/6) clay loam; moderate, medium, subangular blocky structure; firm; medium, continuous, dark reddish-brown (2.5YR 3/4) clay films on faces of peds; very strongly acid; gradual, wavy boundary.

B22t—30 to 42 inches, dark-red (2.5YR 3/6) light clay loam; weak, coarse, subangular blocky structure; firm; thin, nearly continuous, dark reddish-brown (2.5YR 3/4) clay films on faces of peds; very strongly acid; gradual, wavy boundary.

B31t—42 to 57 inches, reddish-brown (5YR 4/4) sandy clay loam; weak, coarse, subangular blocky structure; friable; thin, discontinuous, dark reddish-brown (2.5YR 3/4) clay films on faces of peds; very strongly acid; gradual, wavy boundary.

B32t—57 to 81 inches, yellowish-red (5YR 4/6) light sandy clay loam; weak, coarse, subangular blocky structure; friable; very strongly acid; gradual, wavy boundary.

C—81 to 90 inches, brown (7.5YR 4/4) stratified sand and loamy sand; massive to single grained; friable; very strongly acid.

In cultivated areas the thin, dark-colored A1 horizon and the distinct, brown A2 horizon have been destroyed by plowing. The Ap horizon ranges from dark grayish brown to brown or dark brown, and the A2 horizon is mixed into the plow layer. The B2 horizon ranges from heavy clay loam to sandy clay loam.

The Negley soils have drainage similar to that of Hickory and Parke soils. They have a higher content of sand in the B horizon than those soils. Negley soils do not contain glacial pebbles in the upper part of the solum as do the Hickory soils, and they are not underlain with glacial till as are the Parke and Hickory soils.

Negley loam, 18 to 25 percent slopes (NeE).—This soil is on sides of natural drainageways, where slopes are short and irregular. It has a profile similar to the one described as representative for the series, but the dark-red part of the subsoil is at a slightly greater depth in places. Included in mapping are a few small areas of moderately eroded and severely eroded soils. Also included are small areas of soils that have slopes of less than 18 percent.

Runoff and the risk of erosion are the major limitations to the use and management of this soil. Because slopes are steep, the hazard of erosion is severe if this soil is cultivated. This soil is suited to woods and permanent pasture. Capability unit VIe-1.

Negley loam, 25 to 40 percent slopes (NeF).—This soil is on sides of natural drainageways, where slopes are very steep, short, and irregular. It has the profile described as representative for the series. Included in mapping are small areas of moderately eroded and severely eroded soils and a few small areas of Hickory and Princeton soils.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

Because of the steepness of slopes and the severe hazard of erosion, this soil is better suited to woodland than to most other uses. Capability unit VIIe-1.

Parke Series

The Parke series consists of deep, well-drained, gently sloping to strongly sloping soils on uplands. These soils formed in about 30 inches of loess and in weathered, acid glacial till. The native vegetation was mixed hardwood trees.

In a representative profile the surface layer is about 6 inches of brown silt loam. The subsoil is thicker than 79 inches. The upper 22 inches of the subsoil is strong-brown, friable silt loam that grades to firm light silty clay loam; the next 27 inches is yellowish-red, firm light clay loam that grades to reddish-brown clay loam; and the next layer, to a depth of more than 85 inches, is reddish-brown and strong-brown, stratified sandy clay loam and loamy sand.

Parke soils have high available water capacity and moderate permeability.

Representative profile of Parke silt loam, 12 to 18 percent slopes, eroded, in a field of clover at a point 60 feet east and 280 feet south of the northwest corner of SW¼ SW¼ sec. 10, T. 12 N., R. 8 W.:

Ap—0 to 6 inches, brown (10YR 4/3) silt loam; weak, fine to medium, granular structure; friable; neutral; abrupt, smooth boundary.

B1—6 to 9 inches, strong-brown (7.5YR 5/6) silt loam; weak, fine, subangular blocky structure parting to weak, fine, granular structure; friable; neutral; clear, wavy boundary.

B21t—9 to 22 inches, strong-brown (7.5YR 5/6) light silty clay loam to heavy silt loam; moderate, medium, subangular blocky structure; firm; thin, nearly continuous, brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear, wavy boundary.

B22t—22 to 28 inches, strong-brown (7.5YR 5/6) light silty clay loam; moderate, medium and coarse, subangular blocky structure; firm; thin, nearly continuous, brown (7.5YR 4/4) clay films on faces of peds; few brown (10YR 5/3) splotches; very strongly acid; clear, wavy boundary.

IIB23tb—28 to 36 inches, yellowish-red (5YR 4/6) light clay loam; weak to moderate, coarse, subangular blocky structure; firm; thin, discontinuous, reddish-brown (5YR 4/4) clay films on faces of peds; brown (10YR 5/3) silt coatings on some faces of peds; few, small, very dark grayish-brown (10YR 3/2) splotches; strongly acid; gradual, wavy boundary.

IIB24tb—36 to 55 inches, reddish-brown (5YR 4/3) clay loam; weak, coarse, subangular blocky structure; firm; few reddish-brown (5YR 4/4) clay films on faces of peds and root channels; few very dark grayish-brown (10YR 3/2) splotches; strongly acid; gradual, wavy boundary.

IIB3b—55 to 85 inches, reddish-brown (5YR 4/3) and strong-brown (7.5YR 5/6) stratified sandy clay loam and loamy sand; massive; friable; strongly acid.

The Ap horizon ranges from dark grayish brown to dark brown. The B2t horizon ranges from heavy silt loam to silty clay loam. The B22t horizon commonly contains enough sand to give it a gritty feel. The IIB2tb horizon ranges from clay loam to heavy sandy loam. Depth to the IIB2tb horizon ranges from 20 to 40 inches. In most places the underlying material, at a depth of 50 to 100 inches, is stratified layers of sandy clay loam and loamy sand or sand that contains thin strata of gravel.

The Parke soils have drainage similar to that of Alford and Negley soils. They are more sandy, are more acid, and have a redder color in the lower part of the solum than Alford soils. Parke soils have less sand in the upper part of the solum than Negley soils.

Parke silt loam, 2 to 6 percent slopes, eroded (PaB2).—This soil is on narrow ridgetops and the upper sides of ridges. Included in mapping are small areas of moderately sloping soils and a few small areas of soils that are either more eroded or less eroded than this soil.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

This soil is suited to all cultivated crops commonly grown in the county, including orchard crops. Capability unit IIe–1.

Parke silt loam, 12 to 18 percent slopes, eroded (PaD2).—This soil is on the sides of natural draws and irregular side slopes below ridgetops. It has the profile described as representative for the series. The plow layer is a mixture of the original surface layer and a moderate amount of the subsoil. Included in mapping are small areas of severely eroded soils.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

This soil is suited to small grain, meadow and pasture plants, and orchard crops. The severe hazard of erosion is a limitation to its use for row crops. Capability unit IVe–1.

Petrolia Series

The Petrolia series consists of deep, poorly drained, nearly level soils on flood plains. These soils formed in silty alluvium under a native vegetation of mixed hardwood trees.

In a representative profile the surface layer is about 8 inches of dark-gray silty clay loam. The subsoil is about 56 inches thick. In the upper part it is dark-gray, firm silty clay loam mottled with yellowish brown and dark brown. The lower part of the subsoil is mottled grayish-brown and yellowish-brown, friable heavy silt loam. The underlying material is mottled grayish-brown and yellowish-brown silt loam.

Petrolia soils have high available water capacity and slow permeability.

Representative profile of Petrolia silty clay loam in a fallow field at a point 200 feet east and 400 feet south of the center of NW¼ sec. 13, T. 10 N., R. 11 W.:

Ap—0 to 8 inches, dark-gray (10YR 4/1) silty clay loam; weak, medium, granular structure; firm; neutral; abrupt, smooth boundary.

B21g—8 to 21 inches, dark-gray (10YR 4/1) heavy silty clay loam, dark grayish brown (10YR 4/2) rubbed; moderate, fine, angular and subangular blocky structure; firm; thin, continuous, dark-gray (10YR 4/1) coatings on peds; neutral; gradual, wavy boundary.

B22g—21 to 40 inches, dark-gray (10YR 4/1) silty clay loam; common, fine, distinct, yellowish-brown (10YR 5/6) and dark-brown (7.5YR 3/2) mottles; moderate, medium, angular blocky structure; firm; thin, continuous, dark-gray (10YR 4/1) coatings on peds; neutral; gradual, wavy boundary.

B23g—40 to 51 inches, dark-gray (10YR 4/1) silty clay loam; common, fine, distinct, yellowish-brown (10YR 5/6) and dark-brown (7.5YR 3/2) mottles; weak, medium and coarse, subangular blocky structure; fine, thin, continuous, dark-gray (10YR 4/1) coatings on vertical faces of peds; thin discontinuous coatings on horizontal faces; neutral; clear, wavy boundary.

B3g—51 to 64 inches, mottled grayish-brown (2.5Y 5/2) and yellowish-brown (10YR 5/6, 10YR 5/8) heavy silt loam; weak, coarse, subangular blocky structure; friable; few dark-gray (10YR 4/1) coatings in root channels; few dark-brown (7.5YR 3/2) iron stains; neutral; clear, wavy boundary.

Cg—64 to 77 inches, mottled grayish-brown (2.5Y 5/2) and yellowish-brown (10YR 5/6, 10YR 5/8) silt loam; massive; friable; dark-brown (7.5YR 3/2) iron stains; neutral.

The Ap horizon ranges from dark gray to dark grayish brown. The B2 horizon ranges from dark gray to gray and dark grayish brown and has few to common, yellowish-brown to dark-brown or strong-brown mottles. The underlying material ranges from silty clay loam to silt loam. The solum ranges from slightly acid to mildly alkaline.

Petrolia soils are associated with Armiesburg and Zipp soils. They are more poorly drained than Armiesburg soils and have a grayer surface layer. They have a lower content of clay than Zipp soils.

Petrolia silty clay loam (0 to 2 percent slopes) (Pe).—This soil is on broad bottom lands. Included in mapping is an area along Splunge Creek near the Clay County line that is medium acid in the subsoil.

Flooding and wetness are the major limitations to the use and management of this soil. Some areas are protected by levees, but during periods of high water, seepage from the levees causes some flooding.

This soil is suited to row crops that can be grown during periods that are the most nearly flood free. Corn, soybeans, and grain sorghum are the main crops. Alfalfa and small grain are subject to damage during prolonged periods of flooding. Capability unit IIw–7.

Princeton Series

The Princeton series consists of deep, well-drained, gently sloping to moderately steep soils on uplands. These soils formed in more than 5 feet of windblown sand. The native vegetation was mixed hardwood trees.

In a representative profile the surface layer is about 8 inches of brown fine sandy loam. The subsoil is about 33 inches thick. The upper part of the subsoil is brown, firm sandy clay loam, and the lower part is yellowish-red, friable sandy loam. The underlying material is brown loamy sand, sandy loam, and fine sand.

Princeton soils have moderate available water capacity and moderate permeability.

Representative profile of Princeton fine sandy loam, 2 to 6 percent slopes, in a meadow at a point 300 feet west and 400 feet south from the center of NE¼ sec. 5, T. 10 N., R. 9 W.:

Ap—0 to 8 inches, brown (10YR 4/3) fine sandy loam; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary.

B1t—8 to 11 inches, strong-brown (7.5YR 5/6) loam; weak, thick, platy structure parting to weak, fine, subangular blocky structure; friable; thin, very pale brown (10YR 7/3) silt coatings on faces of peds; thin, discontinuous, dark yellowish-brown (10YR 4/4) clay films on some faces of peds; neutral; clear, wavy boundary.

B21t—11 to 26 inches, brown (7.5YR 4/4) sandy clay loam; moderate, medium, subangular blocky structure; firm; thin, continuous, reddish-brown (5YR 4/4) clay films on faces of most peds; medium acid; gradual, wavy boundary.

B22t—26 to 41 inches, yellowish-red (5YR 5/6) sandy loam; weak, coarse, subangular blocky structure; friable; thin, discontinuous, reddish-brown (5YR 4/4) clay films on faces of peds; medium acid; gradual, wavy boundary.

C&Bt—41 to 60 inches, brown (7.5YR 4/4) loamy sand and sandy loam, banded; weak, coarse, subangular blocky structure; very friable; thin, discontinuous, brown (7.5YR 4/4) clay films on faces of some peds; medium acid; gradual, wavy boundary.

C—60 to 80 inches, strong-brown (7.5YR 5/6) and brown (7.5YR 4/4), stratified loamy sand and fine sand; single grained; loose; slightly acid.

The Ap horizon ranges from dark grayish brown to dark yellowish brown. Some areas undisturbed by plowing have a thin, very dark grayish-brown A1 horizon and a brown to dark yellowish-brown A2 horizon. The upper part of the B horizon ranges from light clay loam to heavy loam, and the lower part is sandy loam or sandy clay loam. The underlying material ranges from loamy sand to sand.

Princeton soils are associated with Alford and Bloomfield soils. They are more sandy and contain less silt than Alford soils. They have a continuous-textured B horizon in the regular position below the A horizon rather than a B horizon that consists of bands as is characteristic of the Bloomfield soils, and they also have a higher content of clay than Bloomfield soils.

Princeton fine sandy loam, 2 to 6 percent slopes (PrB).—This soil is on narrow tops and the sides of ridges and in dunelike areas. It has the profile described as representative for the series. Included in mapping are a few small areas of soils that have lost from 3 to 6 inches of the original surface layer through erosion. These included soils are brighter in color, have a higher content of clay, and are lower in organic-matter content than this Princeton soil. Also included are a few small areas of the more sandy Bloomfield soils.

Soil blowing, water erosion, and runoff are hazards and the moderate available water capacity is a limitation to the use and management of this soil. Damage to crops is likely during prolonged dry periods.

This soil is suited to all cultivated crops commonly grown in the county. Orchard crops and alfalfa are well suited. Capability unit IIe–11.

Princeton fine sandy loam, 6 to 12 percent slopes, eroded (PrC2).—This soil has short irregular slopes. It has a profile similar to the one described as representative for the series, except that some of the strong-brown, more clayey subsoil has been mixed with the brown surface layer by plowing. Included in mapping are a few small areas of the more sandy Bloomfield soils. Also included are a few small areas of soils that are eroded to a greater or lesser degree than this Princeton soil.

Soil blowing, water erosion, and runoff are hazards and the moderate available water capacity is a limitation to the use and management of this soil. Damage to crops is likely during prolonged dry periods.

This soil is suited to all cultivated crops commonly grown in the county. Orchard crops and alfalfa are well suited. Capability unit IIIe–15.

Princeton fine sandy loam, 12 to 18 percent slopes, eroded (PrD2).—This soil is on short side slopes below ridgetops and in areas adjacent to drainageways. It has a profile similar to the one described as representative for the series, except that it is slightly thinner. The surface layer is a mixture of the original brown surface layer and a moderate amount of the strong-brown, more clayey subsoil. Included in mapping are a few small areas of soils that are eroded to a greater or lesser degree than this Princeton soil. Also included are areas of the more sandy Bloomfield soils.

Runoff, soil blowing, and water erosion are hazards and the moderate available water capacity is a limitation to the use and management of this soil. Damage to crops is likely during prolonged dry periods.

This soil is suited to small grain and meadow and pasture plants. An occasional row crop can be grown, but the hazard of erosion is severe if row crops are grown. Orchard crops and alfalfa are well suited. Capability unit IVe–15.

Princeton fine sandy loam, 18 to 25 percent slopes, eroded (PrE2).—This soil is immediately below ridges or sides of natural draws. It has a profile similar to the one described as representative for the series, except that it is slightly thinner. The present surface layer is a mixture of the original brown surface layer and a moderate amount of the strong-brown, more clayey subsoil. Included in mapping are a few small areas that are more sandy than this Princeton soil. Also included are some areas that have a thinner deposit of sandy material over glacial drift.

Runoff, the risk of erosion, and the moderate available water capacity are limitations to the use and management of this soil.

Because of the steepness of slopes and the severe hazard of erosion, this soil is better suited to permanent pasture and woodland than to cultivated crops. Small areas can be used for wildlife habitat. Capability unit VIe–1.

Proctor Series

The Proctor series consists of deep, well-drained, nearly level soils on terraces. These soils formed in about 2 to 3 feet of loess or silty material and the underlying stratified loam, sandy loam, or silt loam outwash. The native vegetation was mainly grasses.

In a representative profile the surface layer is about 19 inches of very dark grayish-brown silt loam. The subsoil is about 39 inches thick. The upper part of the subsoil is dark yellowish-brown, friable heavy silt loam and yellowish-brown, firm light silty clay loam; the middle part is dark yellowish-brown, firm light clay loam; and the lower part is dark yellowish-brown, friable sandy clay loam. The underlying material is dark-brown, stratified layers of medium sand, sandy clay loam, and clay loam.

Proctor soils have high available water capacity and moderate permeability.

Representative profile of Proctor silt loam in a cultivated field at a point 640 feet east and 610 feet south of the northwest corner of NE¼SE¼ sec. 20, T. 11 N., R. 9 W.:

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak to moderate, fine, granular structure; friable; neutral; abrupt, smooth boundary.

A3—9 to 19 inches, very dark grayish-brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate, medium, granular structure; friable; neutral; gradual, wavy boundary.

B1—19 to 25 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; moderate, fine, subangular blocky structure; friable; very dark grayish-brown (10YR 3/2) organic stains on faces of peds and worm casts; medium acid; clear, wavy boundary.

B21t—25 to 36 inches, yellowish-brown (10YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; firm; medium, continuous, dark-brown (10YR 3/3) clay films on faces of peds; medium acid; clear, wavy boundary.

IIB22t—36 to 44 inches, dark yellowish-brown (10YR 4/4) light clay loam that grades to sandy clay loam; weak, moderate to coarse, subangular blocky structure; firm; thin, discontinuous, dark-brown (10YR 3/3) clay films on faces of peds; yellowish-brown (10YR 5/6) silt coatings in root channels; medium acid; clear, wavy boundary.

IIB3—44 to 58 inches, dark yellowish-brown (10YR 3/4) sandy clay loam; weak, coarse, subangular blocky structure; friable; slightly acid; clear, wavy boundary.

IIC—58 to 78 inches, brown (10YR 4/3) stratified layers of medium sand and sandy clay loam, and brown (7.5YR 4/4) bands of clay loam; single grained to massive; loose to friable; slightly acid.

The Ap horizon ranges from very dark brown to very dark grayish brown. The B horizon has dominant colors of yellowish brown, dark yellowish brown, and brown. The B horizon ranges from heavy silt loam to silty clay loam in the upper part and from sandy clay loam or clay loam to gravelly sandy loam in the lower part. The C horizon has stratified layers of clay loam, sandy clay loam, loamy sand, and gravelly sandy clay loam, and it commonly contains thin strata of other textures.

Proctor soils have drainage similar to that of Alford and Camden soils. They have a darker colored surface layer that is higher in organic matter than Alford or Camden soils, and they also have more sand in the lower part of the B horizon and in the C horizon than Alford soils.

Proctor silt loam (0 to 2 percent slopes) (Pt).—This soil is on terraces. Included with it in mapping are small areas of soils that have a more sandy subsoil than this Proctor soil and a few areas of soils that are not so well drained.

Limitations to the use and management of this soil are slight.

This soil is suited to all cultivated crops commonly grown in the county. Capability unit I–1.

Ragsdale Series

The Ragsdale series consists of deep, very poorly drained, nearly level to slightly depressional soils on uplands. These soils formed in loess under a native vegetation of water-tolerant grasses and hardwood trees.

In a representative profile the surface layer is about 16 inches of very dark gray silt loam that grades to black light silty clay loam. The subsoil, about 24 inches thick, is firm light silty clay loam. The upper part of the subsoil is olive gray and is mottled with yellowish brown and olive. The lower part is yellowish brown and is mottled with olive and olive gray. The underlying material is mottled yellow-brown, olive-gray, olive, and light brownish-gray light silty clay loam that grades to silt loam.

Ragsdale soils have high available water capacity and slow permeability. They are subject to ponding.

Representative profile of Ragsdale silt loam in a cultivated field at a point 140 feet north and 200 feet west of the southeast corner of SW¼SW¼ sec. 35, T. 11 N. R. 9 W.:

Ap—0 to 8 inches, very dark gray (10YR 3/1) silt loam; weak, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A1—8 to 16 inches, black (10YR 2/1) light silty clay loam; weak, fine, subangular blocky structure; firm; neutral; gradual, wavy boundary.

B21tg—16 to 32 inches, olive-gray (5Y 5/2) light silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) and olive (5Y 5/4) mottles; weak, medium and coarse, subangular blocky structure; firm; thin, nearly continuous, dark-gray (10YR 4/1) clay films on faces of peds; neutral; clear, wavy boundary.

B22t—32 to 40 inches, yellowish-brown (10YR 5/6) light silty clay loam; many, medium, distinct, olive (5Y 5/3) and olive-gray (5Y 5/2) mottles; weak, coarse, subangular blocky structure; firm; few wormholes filled with very dark gray (10YR 3/1) silt loam; neutral; clear, wavy boundary.

C1—40 to 48 inches, yellowish-brown (10YR 5/6) light silty clay loam; common, medium, distinct, olive-gray (5Y 5/2) and olive (5Y 5/3) mottles; massive; firm; krotovinas 1 inch in diameter filled with black (10YR 2/1) silt loam; neutral; clear, wavy boundary.

C2—48 to 60 inches, mottled yellowish-brown (10YR 5/6), light brownish-gray (10YR 6/2), and olive (5Y 5/3) silt loam; massive; friable; neutral.

The Ap horizon ranges in color from black to very dark grayish brown and commonly is heavy silt loam in texture. The thickness of the A horizon ranges from 10 to 20 inches but commonly is in the middle of the range. The B horizon ranges from olive gray mottled with yellowish brown or brown in the upper part to yellowish brown mottled with shades of gray in the lower part. The B2 horizon is light silty clay loam or silty clay loam. The thickness of the solum ranges from 36 to 52 inches.

The Ragsdale soils have drainage similar to that of Rensselaer soils and are associated with Reesville soils. They have a lower content of sand than Rensselaer soils. Ragsdale soils have a darker colored surface layer and are more poorly drained than the Reesville soils.

Ragsdale silt loam (0 to 2 percent slopes) (Rc).—This soil is in depressions on uplands. Included in mapping are small areas that have a light silty clay loam surface layer. Also included are small areas of somewhat poorly drained soils and a few areas of soils that have a slightly acid subsoil.

Wetness is the major limitation to the use and management of this soil.

This soil is suited to all the common cultivated crops in the county if a suitable drainage system is established and maintained. It can also be used for permanent pasture plants and trees that are tolerant of wetness. Capability unit IIw–1.

Randolph Series

The Randolph series consists of moderately deep, somewhat poorly drained, nearly level soils on terraces cut in bedrock. These soils formed in 20 to 40 inches of loess or glacial drift and the underlying residuum from limestone bedrock. The native vegetation was mixed hardwood trees.

In a representative profile the surface layer is about 10 inches of silt loam that is dark grayish-brown in the upper part and grayish brown in the lower part. The subsoil is about 27 inches thick. The upper 5 inches of the subsoil is mottled, brown, firm heavy silt loam to light silty clay loam. The next 18 inches is mottled yellowish-brown, light olive-brown, and grayish-brown, very firm heavy silty clay loam that grades to firm silty clay loam. The lower 4 inches is gray, firm light silty clay that has a few light olive-brown mottles. The underlying material is hard, level-bedded limestone bedrock.

Randolph soils have low to moderate available water capacity and slow permeability.

Representative profile of Randolph silt loam, 0 to 3 percent slopes, in a fallow field at a point 760 feet east and 900 feet south from the northwest corner of sec. 1, T. 11 N., R. 10 W.:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

A2—7 to 10 inches, grayish-brown (10YR 5/2) silt loam, light gray (10YR 7/2) when dry; few, fine, faint, yellowish-brown (10YR 5/4, 10YR 5/6) mottles; weak, thick, platy structure parting to weak, medium and coarse, granular structure; firm; medium acid; clear, wavy boundary.

B1—10 to 15 inches, brown (10YR 5/3) heavy silt loam to light silty clay loam, very pale brown (10YR 7/3) when dry; moderate, medium, distinct, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/4, 10YR 5/6) mottles; moderate, fine, subangular blocky structure; firm; thin, nearly continuous, light-gray (10YR 7/2) silt coats on faces of peds; strongly acid; clear, wavy boundary.

B21t—15 to 26 inches, mottled yellowish-brown (10YR 5/4, 10YR 5/6) and dark grayish-brown (10YR 4/2) heavy silty clay loam; weak, medium, prismatic structure parting to moderate, medium, subangular blocky structure; very firm; medium, continuous, dark grayish-brown (10YR 4/2) clay films on faces of peds; silt coats that are thin, discontinuous, and light brownish gray (10YR 6/2) when dry on vertical faces of some peds; few, fine, black (10YR 2/1) iron stains; strongly acid; clear, wavy boundary.

B22t—26 to 33 inches, light olive-brown (2.5Y 5/4, 2.5Y 5/6) silty clay loam; many, medium, distinct, grayish-brown (2.5YR 5/2), light brownish-gray (10YR 6/2), and yellowish-brown (10YR 5/6, 10YR 5/8) mottles; weak, coarse, subangular blocky structure; firm; thin, discontinuous, dark grayish-brown (10YR 4/2) clay films on faces of peds; few, fine, black (10YR 2/1) iron stains; few roots; neutral; clear, wavy boundary.

IIB3g—33 to 37 inches, gray (5Y 5/1) light silty clay; few, fine, distinct, light olive-brown (2.5Y 5/6) mottles; weak, coarse, subangular blocky structure; firm; few, fine, black (10YR 2/1) iron stains; few dark reddish-brown (5YR 3/2) coatings in root channels; neutral; abrupt, irregular boundary.

IIR—37 to 60 inches, hard, level-bedded limestone bedrock.

Thickness of the solum and the depth to bedrock range from 20 to 40 inches. The Ap horizon ranges from dark grayish brown to grayish brown. The A2 horizon ranges from gray to grayish brown. The B2 horizon is heavy silty clay loam to clay loam. It is medium acid to strongly acid in the upper part and is neutral in the lower part.

Randolph soils have drainage similar to that of Ayrshire soils. They contain more clay in the B horizon than Ayrshire soils and are underlain by limestone at a more shallow depth.

Randolph silt loam, 0 to 3 percent (RdA).—This soil is on terraces cut in bedrock. Included in mapping are some small areas of soils that have a loam surface layer. Also included are some small areas that are underlain by sandstone and are more acid in the lower part of the subsoil than this Randolph soil. A few small areas of poorly drained soils also are included.

Wetness and moderate depth to bedrock are the major limitations to the use and management of this soil.

This soil is suited to corn, soybeans, small grain, and grasses and legumes if it is adequately drained. During seasons of below-normal rainfall or poor rainfall distribution, crops are subject to damage from drought. Seepy and undrained areas are commonly used for pasture and woodlots. Capability unit IIIw–7.

Reesville Series

The Reesville series consists of deep, somewhat poorly drained, nearly level soils on uplands. These soils formed in loess under a native vegetative cover of mixed hardwoods.

In a representative profile the surface layer is about 10 inches of grayish-brown silt loam. The subsoil is about 32 inches thick and is mottled with light grayish brown and yellowish brown. The upper two-thirds of the subsoil is firm silty clay loam, and the lower one-third is friable silt loam. The underlying material is yellowish-brown silt loam that grades to silt and is mottled with shades of gray.

Reesville soils have high available water capacity and slow permeability.

Representative profile of Reesville silt loam in a cultivated field at a point 360 feet east and 30 feet south of the northwest corner of NW¼SE¼ sec. 22, T. 11 N., R. 9 W.:

Ap—0 to 7 inches, grayish-brown (10YR 5/2) silt loam; moderate, fine and medium, granular structure; friable; neutral; abrupt, smooth boundary.

A2—7 to 10 inches, grayish-brown (10YR 5/2) silt loam; few, medium, distinct, yellowish-brown (10YR 5/4, 10YR 5/6) mottles; weak, medium, platy structure; friable; medium acid; clear, wavy boundary.

B1—10 to 14 inches, yellowish-brown (10YR 5/6) light silty clay loam; many, medium, distinct, light brownish-gray (10YR 6/2) mottles; moderate, fine, subangular blocky structure; firm; thin, discontinuous, grayish-brown (10YR 5/2) clay films on faces of peds; few, fine, black (10YR 2/1) iron and manganese concretions; medium acid; clear, wavy boundary.

B21tg—14 to 19 inches, mottled light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/6) silty clay loam; moderate, fine and medium, subangular blocky structure; firm; medium, continuous, dark grayish-brown (10YR 4/2) clay films on faces of peds; few, fine, black (10YR 2/1) iron and manganese concretions; medium acid; clear, wavy boundary.

B22tg—19 to 32 inches, mottled yellowish-brown (10YR 5/6, 10YR 5/8) and light brownish-gray (10YR 6/2) silty clay loam; moderate, medium, prismatic structure parting to weak, coarse, subangular blocky structure; firm; medium, continuous, dark-gray (10YR 4/1) and dark grayish-brown (10YR 4/2) clay films on faces of peds; common, medium, black (10YR 2/1) iron and manganese concretions; neutral; gradual, wavy boundary.

B3—32 to 42 inches, mottled yellowish-brown (10YR 5/6, 10YR 5/4) and light brownish-gray (10YR 6/2) silt loam; weak, coarse, prismatic structure; friable; thin, discontinuous, dark-gray (10YR 4/1) and dark grayish-brown (10YR 4/2) clay films on faces of peds; few, fine, black (10YR 2/1) iron and manganese concretions; neutral; gradual, wavy boundary.

C1—42 to 53 inches, mottled yellowish-brown (10YR 5/6, 10YR 5/4) and light brownish-gray (10YR 6/2) light silt loam; weak, coarse, prismatic structure to massive; friable; few, fine, black (10YR 2/1) iron and manganese concretions; mildly alkaline; clear, wavy boundary.

C2—53 to 89 inches, yellowish-brown (10YR 5/6) silt; few, fine, distinct, light brownish-gray (10YR 6/2) and very pale brown (10YR 7/3) mottles; massive; friable; few, fine, black (10YR 2/1) iron and manganese concretions; moderately alkaline.

The Ap horizon ranges from dark grayish brown to grayish brown. The B2 horizon ranges from silty clay loam to heavy silt loam and from grayish brown or light brownish gray to yellowish brown or light olive brown, and it is mottled. The thickness of the loess ranges from 5 to 8 or more feet. Depth to carbonates ranges from 30 to 60 inches.

The Reesville soils are associated with Muren and Ragsdale soils. They are naturally more poorly drained than Muren soils and are not leached to so great a depth. Reesville soils are lighter colored, contain less organic matter, and have better natural drainage than Ragsdale soils.

Reesville silt loam (0 to 2 percent slopes) (Re).—This soil is in broad areas on uplands. Included in mapping are some small areas of very poorly drained Ragsdale soils and some small areas of soils that are underlain by neutral fine sands.

Wetness is a major limitation to the use and management of this soil.

This soil is suited to all cultivated crops commonly grown in the county if an adequate drainage system is established and maintained. It also is suited to permanent pasture plants and trees that are tolerant of wetness. Capability unit IIw–2.

Rensselaer Series

The Rensselaer series consists of deep, very poorly drained, nearly level to slightly depressional soils on terraces and uplands. These soils formed in loamy lake-laid material under a native vegetation of trees and grasses tolerant of wetness.

In a representative profile the surface layer is about 12 inches of very dark gray loam. The subsoil, about 50 inches thick, is dark gray and is mottled with yellowish brown and brown. The upper 9 inches of the subsoil is friable sandy loam, the middle part is firm clay loam, and the lower part grades from firm sandy clay loam to friable light sandy loam. The underlying material is grayish-brown medium and fine sand.

Rensselaer soils have high available water capacity and slow permeability. They are subject to ponding.

Representative profile of Rensselaer loam in a cultivated field at a point 400 feet east and 100 feet north of the center of NE¼ sec. 10, T. 13 N., R. 8 W.:

Ap—0 to 12 inches, very dark gray (10YR 3/1) loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B1g—12 to 21 inches, dark-gray (10YR 4/1) sandy loam; few, fine, faint, brown (10YR 5/3) and yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; friable; neutral; clear, wavy boundary.

B21tg—21 to 34 inches, dark-gray (10YR 4/1) clay loam; common, medium, distinct, brown (10YR 5/3) and yellowish-brown (10YR 5/4, 10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; thin, discontinuous, very dark gray (10YR 3/1) clay films on faces of peds and sand grains; neutral; clear, wavy boundary.

B22tg—34 to 40 inches, dark-gray (10YR 4/1) clay loam, common, medium, distinct, yellowish-brown (10YR 5/6, 10YR 5/8) mottles; moderate, medium, subangular blocky structure; firm; thin, discontinuous, very dark gray (10YR 3/1) clay films on some faces of peds; neutral; clear, wavy boundary.

B23tg—40 to 55 inches, dark-gray (10YR 4/1) sandy clay loam; common, fine, faint, brown (10YR 5/3) mottles; weak, medium, subangular blocky structure; firm; neutral; clear, wavy boundary.

B3g—55 to 62 inches, dark-gray (10YR 4/1) light sandy loam; common, fine, faint, brown (10YR 5/3) mottles; weak, coarse, subangular blocky structure parting to massive; friable; neutral; clear, wavy boundary.

Cg—62 to 72 inches, grayish-brown (10YR 5/2) medium and fine sand; few, fine, faint, brown (10YR 5/3) and yellowish-brown (10YR 5/4) mottles; single grained; loose; neutral.

The Ap horizon ranges from very dark gray to black in color and from 10 to 18 inches in thickness. The A horizon ranges from light loam to silty clay loam. The dominant texture of the B2 horizon is clay loam, but layers of sandy loam or silty clay loam are present in places.

The Rensselaer soils have drainage similar to that of Ragsdale and Zipp soils. They are more sandy than Zipp and Ragsdale soils, and they have a darker colored surface layer than Zipp soils.

Rensselaer loam (0 to 2 percent slopes) (Rg).—This soil is in depressional areas on terraces and uplands. It has the profile described as representative for the series. Included in mapping are a few areas of soils that have a sandy loam surface layer and a sandy clay loam subsoil. Also included are a few small areas of soils that have a clay loam or silty clay loam surface layer.

Wetness and ponding are the major limitations to the use and management of this soil.

This soil is suited to all the common cultivated crops in the county if a suitable drainage system is established and maintained. It also is suited to permanent pasture plants and trees that are tolerant of wetness. Capability unit IIw–1.

Rensselaer clay loam (0 to 2 percent slopes) (Rn).—This soil is in depressional areas on nearly level terraces and uplands. It has a profile similar to the one described as representative for the series, except that the surface layer contains more clay and less sand. Included in mapping are a few areas of soils that have a silty clay loam surface layer.

Wetness and ponding are the major limitations to the use and management of this soil.

This soil is suited to corn, soybeans, small grain, meadow, and pasture plants if an adequate drainage system is established and maintained. Capability unit IIw–1.

Rodman Series

The Rodman series consists of shallow, excessively drained, very steep soils on terraces. These soils formed in loamy outwash material and are underlain at a depth of 8 to 15 inches by calcareous gravel and sand. The native vegetation was mixed hardwood trees and grasses.

In a representative profile the surface layer is about 7 inches of black gravelly loam. The subsoil, about 7 inches thick, is dark yellowish-brown, very friable gravelly loam. The underlying material is dark grayish-brown, loose, calcareous gravel and sand.

Rodman soils have low available water capacity and very rapid permeability.

Representative profile of Rodman gravelly loam, 25 to 50 percent slopes, in a wooded area at a point 30 feet east and 640 feet south of the northwest corner of NE¼SE¼ sec. 22, T. 13 N., R. 9 W.:

A—0 to 7 inches, black (10YR 2/1) gravelly loam; weak, fine, granular structure; very friable; mildly alkaline; clear, wavy boundary.

B—7 to 14 inches, dark yellowish-brown (10YR 3/4) gravelly loam; weak, fine and medium, granular structure; very friable; mildly alkaline; abrupt, wavy boundary.

C—14 to 60 inches, dark grayish-brown (10YR 4/2) gravel and sand; single grained; loose; moderately alkaline and calcareous.

Thickness of the solum ranges from 8 to 15 inches. The A horizon ranges from black to very dark grayish brown or very dark gray. The B horizon ranges from loam to gravelly loam or sandy loam.

Rodman soils are similar to Warsaw soils, but they have a thinner solum that is higher in content of gravel and sand.

Rodman gravelly loam, 25 to 50 percent slopes (RoG).—This soil is on sharp breaks adjacent to more nearly level areas on terraces. It commonly is on escarpments between bottom lands and terraces. Included in mapping are a few small areas of Bloomfield soils and a few small areas of soils that are deeper to calcareous material than is typical for the series. Also included are a few small areas of less sloping soils.

The risk of erosion and the low available water capacity are limitations to the use and management of this soil.

This soil is suited to timber. The less sloping areas are suited to drought-tolerant permanent pasture plants if grazing is carefully controlled. Capability unit VIIs-I.

Russell Series

The Russell series consists of deep, well-drained, gently sloping to strongly sloping soils on uplands. These soils formed in loess and the underlying glacial till. The mantle of loess is about 2 to 3 feet thick. The native vegetation was mainly mixed hardwood trees.

In a representative profile the surface layer is about 8 inches of dark grayish-brown silt loam. The subsoil is about 40 inches thick. The upper part of the subsoil is yellowish-brown, firm light silty clay loam, and the lower part is yellowish-brown, firm clay loam that contains some pebbles. The underlying material is yellowish-brown, calcareous clay loam and loam till that has many pebbles and a few stones.

Russell soils have high available water capacity and moderate permeability.

Representative profile of Russell silt loam, 2 to 6 percent slopes, eroded, in a pasture at a point 640 feet west and 50 feet north of the southeast corner of NE¼NE¼ sec. 15, T. 13 N., R. 10 W.:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; contains some yellowish-brown (10YR 5/6) splotches; medium acid; abrupt, smooth boundary.

B21t—8 to 17 inches, yellowish-brown (10YR 5/6) light silty clay loam; moderate, fine, subangular blocky structure; firm; thin, discontinuous, dark yellowish-brown (10YR 4/4) clay films on faces of peds; medium acid; clear, wavy boundary.

B22t—17 to 26 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, medium and fine, subangular blocky structure; firm; thin, discontinuous dark yellowish-brown (10YR 4/4) clay films on faces of peds; medium acid; clear, wavy boundary.

IIB23t—26 to 36 inches, yellowish-brown (10YR 5/4) clay loam; moderate, coarse, subangular blocky structure; firm; thin, discontinuous, dark yellowish-brown (10YR 4/4) clay films on faces of peds; light brownish-gray (10YR 6/2) silt coatings; few small pebbles; medium acid; clear, wavy boundary.

IIB3—36 to 48 inches, yellowish-brown (10YR 5/4) light clay loam; weak, coarse, subangular blocky structure; firm; few yellowish-brown (10YR 5/6) splotches; few very dark brown (10YR 2/2) iron and manganese concretions; few angular pebbles; slightly acid; gradual, wavy boundary.

IIC1—48 to 58 inches, yellowish-brown (10YR 5/4) light clay loam; massive; friable; many angular pebbles; mildly alkaline; gradual, wavy boundary.

IIC2—58 to 80 inches, yellowish-brown (10YR 5/4) loam till; massive; friable; few stones and many pebbles; moderately alkaline and calcareous.

The thickness of the solum is commonly about 50 inches but ranges from 42 to 70 inches. Thickness of the solum commonly corresponds with depth to calcareous till. The A horizon ranges from dark grayish brown to brown and yellowish brown in areas that are eroded. It ranges from 9 to 12 inches in thickness where it is not eroded. The loess mantle is 22 to 40 inches thick over loamy till. The upper part of the B horizon ranges from heavy silt loam to silty clay loam, and the lower part is clay loam to light clay loam. This horizon formed in both the loess and the underlying till. It ranges from medium acid to very strongly acid.

Russell soils have drainage similar to that of Alford soils, and they are associated with Xenia soils. They formed in both loess and till, but Alford soils formed entirely in loess. Russell soils are naturally better drained than Xenia soils and are free of mottling in the B horizon.

Russell silt loam, 2 to 6 percent slopes, eroded (RuB2).—This soil is on long, narrow ridges and short breaks adjacent to ridgetops. It has the profile described as representative for the series. The plow layer is a mixture of the original surface layer and some of the yellowish-brown subsoil. Included in mapping are small areas of slightly eroded Russell soils that have a thicker surface layer. Also included are some areas of severly eroded soils in which there are numerous gullies or the subsoil is exposed.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

This soil is suited to all the common cultivated crops in the county. Capability unit IIe–3.

Russell silt loam, 6 to 12 percent slopes, eroded (RuC2).—This soil is on long, narrow ridges or in bands along the top of more steeply sloping soils. The plow layer is a mixture of the original surface layer and some of the yellowish-brown subsoil. Included in mapping are small areas of slightly eroded Russell soils that have a thicker surface layer. Also included are some small areas of severely eroded soils that have the subsoil exposed.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

This soil is suited to all crops commonly grown in the county. Capability unit IIIe–3.

Russell silt loam, 6 to 12 percent slopes, severely eroded (RuC3).—This soil is in areas near the heads of draws and along drainageways. It has a profile similar to the one described as representative for the series, but most of the original surface layer has been removed by erosion. In many places the yellowish-brown silty clay loam subsoil is exposed. Numerous small gullies transect this soil. Included in mapping are small areas of slightly eroded and moderately eroded Russell soils and a few small areas of soils that have slopes of less than 6 percent and more than 12 percent.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

This soil is suited to small grain, orchard crops, meadow and pasture plants, and timber. Capability unit IVe–3.

Russell silt loam, 12 to 18 percent slopes, eroded (RuD2).—This soil is near heads of drainageways and immediately below narrow ridgetops. Most slopes are short. It has a profile similar to the one described as representative for the series, except that it is slightly thinner and the loess cap is thinner. Included in mapping are a few areas of soils that are either more or less eroded than this soil.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

This soil is suited to small grain, orchard crops, meadow and pasture plants, and timber. The severe hazard of erosion limits use for row crops. Capability unit IVe–3.

Shoals Series

The Shoals series consists of deep, somewhat poorly drained, nearly level soils on bottom lands. These soils formed in medium-textured alluvium along streams throughout the county. The native vegetation was mixed hardwood forest.

In a representative profile the surface layer is about 11 inches of dark grayish-brown silt loam. The subsoil is about 42 inches thick. The upper 6 inches is light brownish-gray, friable silt loam that has yellowish-brown mottles and feels gritty. The major part of the subsoil is mottled light brownish-gray and yellowish-brown, friable loam that is neutral in reaction. The underlying material is yellowish-brown, friable to loose, stratified layers of loam, loamy sand, and sand.

Shoals soils have high available water capacity and moderate permeability. They are subject to flooding.

Representative profile of Shoals silt loam in a pasture at a point 80 feet north and 300 feet west of the center of SE¼ sec. 9, T. 11 N., R. 8 W.:

Ap—0 to 11 inches, dark grayish-brown (10YR 4/2) silt loam, brown (10YR 5/3) when crushed; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B1g—11 to 17 inches, light brownish-gray (10YR 6/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6, 10YR 5/8) mottles; weak, medium, subangular blocky structure; friable; few, medium, very dark brown (10YR 2/2) iron and manganese concretions; neutral; clear, wavy boundary.

B2g—17 to 53 inches, mottled yellowish-brown (10YR 5/4, 10YR 5/8) and light brownish-gray (10YR 6/2) loam; weak, coarse, subangular blocky structure; friable; neutral; gradual, wavy boundary.

IIC—53 to 78 inches, yellowish-brown (10YR 5/4) stratified loamy sand, loam, and sand; massive to single grained; friable to loose; neutral.

The solum is slightly acid to neutral. The Ap horizon ranges from dark grayish brown to light brownish gray. The B horizon varies in texture and in places contains layers of silt loam, loam, light silty clay loam, or light clay loam and thin strata of other textures. The content of sand typically is more than 20 percent. The B horizon generally is gray, light brownish gray, or grayish brown, but some subhorizons are dominated with brighter colors. The B horizon is mottled. The C horizon is stratified and in places has layers of silt loam, loam, and sandy loam. Sand and gravel are common below a depth of 50 to 60 inches.

The Shoals soils are asociated with Eel and Wakeland soils. They are more poorly drained, are grayer, and have mottles at a shallower depth than Eel soils. They contain more sand in the B horizon than Wakeland soils.

Shoals silt loam (0 to 2 percent slopes) (Sh).—This soil is on bottom lands. Included in mapping are a few small areas of moderately well drained Eel soils and a few areas of Shoals soils that have a loam surface layer.

Wetness and flooding are limitations to the use and management of this soil.

If a suitable drainage system is established and maintained, this soil is suited to corn, soybeans, and meadow and pasture plants. Small grain and alfalfa are subject to severe damage from flooding in winter and early in spring. Undrained areas are suited to trees that tolerate wetness. Capability unit IIw–7.

Sloan Series

The Sloan series consists of deep, very poorly drained, nearly level to slightly depressional soils on flood plains. These soils formed in loamy alluvium in areas along the Wabash River and other major streams. The native vegetation was water-tolerant trees.

In a representative profile the surface layer is very dark gray and is about 13 inches thick. It is light clay loam in the upper part and clay loam in the lower part. A few brown mottles are at a depth below 8 inches. The subsoil is about 28 inches thick. The main colors are dark gray and dark grayish brown, but there are mottles of brown, yellowish brown, and olive brown. The major part of the subsoil is friable light clay loam, and the lower few inches is sandy clay loam. The underlying material is mottled yellowish-brown, dark-gray, light brownish-gray, and pale-brown, stratified sandy clay loam, gravelly sandy loam, and gravelly loam.

Sloan soils have high available water capacity and moderate permeability. They are subject to flooding.

Representative profile of Sloan clay loam in a fallow field at a point 120 feet west and 100 feet north from the southeast corner of NE¼ sec. 19, T. 10 N., R. 10 W.:

Ap—0 to 8 inches, very dark gray (10YR 3/1) light clay loam; weak, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A1—8 to 13 inches, very dark gray (10YR 3/1) clay loam; few, fine, faint, brown (7.5YR 4/4) motles; weak medium, subangular blocky structure; firm; neutral; clear, wavy boundary.

B21g—13 to 28 inches, dark-gray (10YR 4/1) light clay loam; few, fine, faint, brown (7.5YR 4/4) mottles; weak, medium, subangular blocky structure; friable; neutral; abrupt, wavy boundary.

B22g—28 to 35 inches, dark grayish-brown (2.5YR 4/2) light clay loam; many, medium, distinct, yellowish-brown (10YR 5/6, 10YR 5/8) and olive-brown (2.5YR 4/4) mottles; weak, coarse, subangular blocky structure; friable; neutral; abrupt, wavy boundary.

B3g—35 to 41 inches, dark-gray (5Y 4/1) sandy clay loam; few, fine, faint, yellowish-brown (10YR 5/6) and olive-brown (2.5Y 4/4) mottles; massive; friable; neutral; abrupt, wavy boundary.

IIC—41 to 65 inches, mottled yellowish-brown (10YR 5/6, 10YR 5/8), dark-gray (10YR 4/1), light brownish-gray (2.5YR 6/2), and pale-brown (10YR 6/3), stratified sandy clay loam, gravelly sandy loam, and gravelly loam; massive; friable to very friable; mildly alkaline and calcareous.

The Ap horizon ranges from very dark gray to black. The B horizon ranges from dark gray to olive gray, gray, and grayish brown. The texture ranges from silty clay loam to loam; it varies because of stratification. The average content of clay is about 28 to 30 percent. The C horizon is stratified and is of variable texture.

Sloan soils are associated with Shoals and Zipp soils. They are more poorly drained, contain more organic matter, and are darker colored than Shoals soils. They are darker colored, higher in content of organic matter, and lower in content of clay than Zipp soils.

Sloan clay loam (0 to 2 percent slopes) (So).—This soil is nearly level to slightly depressional on flood plains. Included in mapping are small areas of soils that are covered with as much as 10 inches of loam or silt loam overwash and a few small areas of soils that have a silty clay loam surface layer.

Wetness and flooding are limitations to the use and management of this soil. Much of the acreage has been cleared and artificially drained and is cultivated.

The main crops are corn and soybeans. Alfalfa and small grain are subject to severe damage during prolonged periods of flooding. Undrained areas are better suited to water-tolerant trees than to most crops. Capability unit IIIw-9.

Strip Mines

Strip mines (St) are areas where coal has been removed by strip mining. These areas are mostly a half a section or more in size, but they range from about 2 acres to more than 1,500 acres. Strip mines are located mainly on uplands. Rubble piles from shaft mines are included in this mapping unit and consist mainly of spoil removed from the mines.

Strip mines consist of long, narrow, steep mounds of mine spoil and a few open pits. The spoil is mainly a mixture of soil, rock fragments, and a little coal. The mining operation is carried out in a way that places most of the friable material on top of the spoil to make the area more suitable for vegetation.

The last cut from which coal has been removed generally is left open. After a short time, it fills with water and forms a deep lake or a pond (fig. 12). About 1 acre in every 7 that is strip mined becomes an open area of water. Most of the lake acreage is stocked with fish, and the remaining acreage provides an excellent habitat for birds and other forms of wildlife. Many areas in the county have been reclaimed, and many cottages and permanent homes have been built near some of the larger lakes (fig. 13).

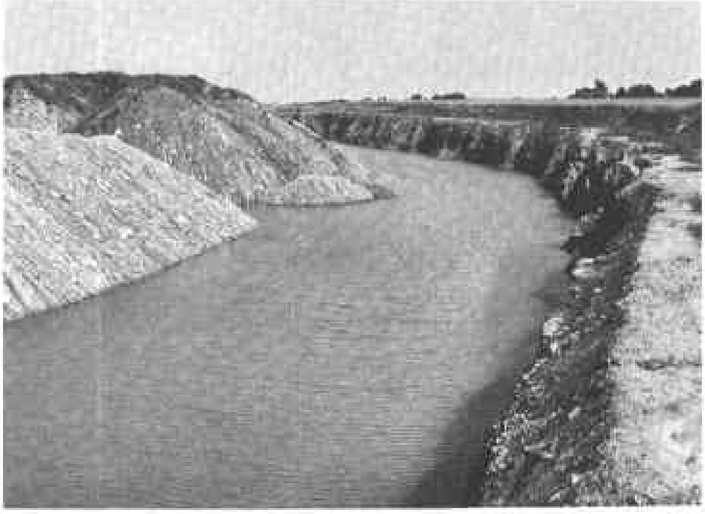


Figure 12.—An area recently strip mined for coal. Pit is beginning to fill with water.

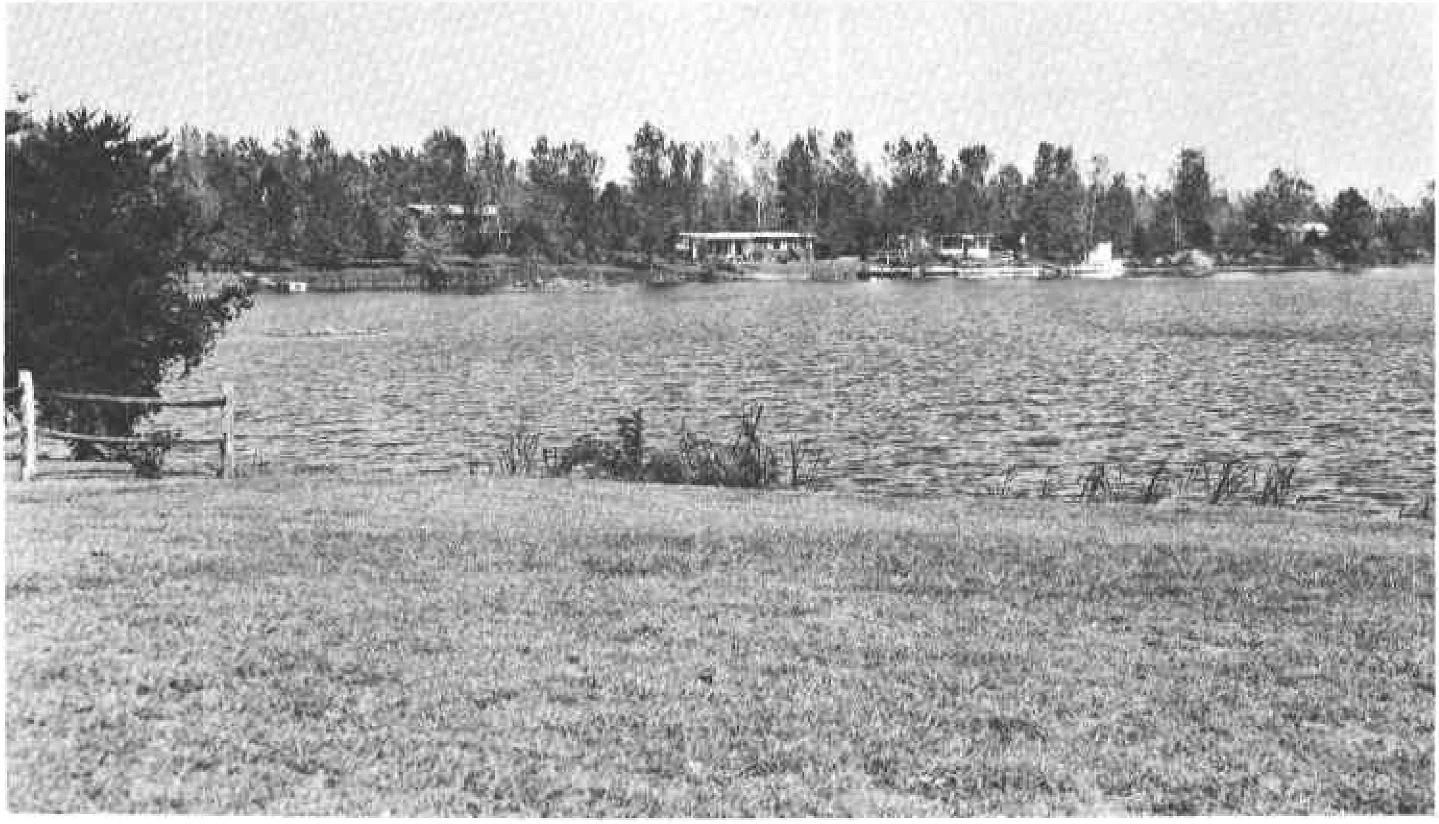


Figure 13.—Permanent homes on lakeshore in a strip-mined area.

The friable material in the spoil is predominantly loess or till, and if planted to trees or grass, it produces cover in a few years. A few small areas, however, are strongly acid because of the acid-bearing rock material and may require several years of leaching before trees can be grown successfully. All of the older strip-mined areas have been planted to trees. Some of the areas mined most recently have been partially leveled and are planted to grass and legumes. A law, which became effective in 1968, places new restrictions on strip mining and requires that all new areas mined be leveled to certain specifications. All areas recorded in this survey, however, were mined before the law became effective. Capability unit VIIe-3.

Tippecanoe Series

The Tippecanoe series consists of deep, moderately well drained, nearly level soils on terraces. These soils formed in about 2 feet of loess or silty material and the underlying loamy glacial outwash under a native vegetative cover of tall prairie grasses. The soils are underlain by stratified layers of coarse sand to light sandy clay loam at a depth ranging from 42 to 70 inches.

In a representative profile the surface layer is about 17 inches of very dark brown silt loam. The subsoil is about 37 inches thick. The upper part of the subsoil is brown, firm silty clay loam, and the lower part is mainly mottled, dark yellowish-brown, firm clay loam that grades to sandy clay loam. The underlying material is dark yellowish-brown and brown, stratified layers of coarse sand, loamy sand, and light sandy loam.

Tippecanoe soils have high available water capacity and moderate permeability.

Representative profile of Tippecanoe silt loam in a field of clover at a point 160 feet west and 360 feet south of the northeast corner of SE¼ sec. 9, T. 11 N., R. 9 W.:

Ap—0 to 8 inches, very dark brown (10YR 2/2) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A12—8 to 17 inches, very dark brown (10YR 2/2) silt loam; moderate to strong, medium, subangular blocky structure; friable; medium acid; clear, wavy boundary.

B1—17 to 22 inches, brown (10YR 4/3) light silty clay loam; weak to moderate, fine and medium, subangular blocky structure; firm; few coarse sand grains; very dark grayish-brown (10YR 3/2) organic coats on most peds; strongly acid; clear, wavy boundary.

B21t—22 to 27 inches, brown (10YR 4/3) and dark yellowish-brown (10YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; thin, nearly continuous, dark-brown (10YR 3/3) clay films on faces of peds; few yellowish-brown (10YR 5/6) splotches; strongly acid; clear, wavy boundary.

IIB22t—27 to 38 inches, dark yellowish-brown (10YR 4/4) clay loam; common, fine, distinct, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/6) mottles; moderate, medium, prismatic structure; firm; thin, continuous, dark yellowish-brown (10YR 3/4) clay films on faces of peds; few, fine, very dark brown (10YR 2/2) iron and manganese concretions; strongly acid; gradual, wavy boundary.

IIB23t—38 to 46 inches, dark yellowish-brown (10YR 4/4) clay loam; many, medium, distinct, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/6, 10YR 5/8) mottles; weak, medium and coarse, prismatic structure parting to weak, coarse, subangular blocky structure; firm; thin, discontinuous, dark yellowish-brown (10YR 3/4) clay films on faces of peds; few, fine, very dark-brown (10YR 2/2) iron and manganese concretions; strongly acid; gradual, wavy boundary.

IIB3—46 to 54 inches, brown (10YR 4/3) and dark yellowish-brown (10YR 4/4) sandy clay loam; common, fine, faint, yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) mottles; weak, coarse, subangular blocky structure; friable; medium acid; clear, wavy boundary.

IIC—54 to 80 inches, dark yellowish-brown (10YR 4/4) and brown (10YR 4/3), stratified layers of coarse sand, loamy sand, and light sandy loam; single grained to massive; loose to very friable; medium acid, becoming neutral at a depth of 80 inches.

The thickness of the solum, and generally the depth to the stratified layers, ranges from 42 to 70 inches. The A horizon ranges from black to very dark brown or very dark grayish brown. The B horizon has dominant colors of brown to dark yellowish brown. Gray mottles generally occur at a depth of about 2 feet but in places are present at a depth of 18 to 30 inches. The B horizon ranges from heavy silt loam or silty clay loam to clay loam in the upper part and to sandy clay loam or loamy sand in the lower part, and the content of sand increases with depth. The average sand content of the size fraction coarser than very fine sand is greater than 15 percent in the B horizon. The B horizon ranges from slightly acid to strongly acid. The C horizon has stratified layers of sand, loamy sand, and sandy clay loam and thin strata of gravel. This horizon is medium acid in the upper part and in places becomes moderately alkaline with increasing depth.

Tippecanoe soils are associated with Crane and Proctor soils. They have better natural drainage than Crane soils, and they are more sandy and less well drained than Proctor soils.

Tippecanoe silt loam (0 to 2 percent slopes) (Tp).—This soil is on terraces. Included with it in mapping are small areas of somewhat poorly drained Crane soils and well-drained Proctor soils.

Limitations to use and management of this soil are slight. The soil is suited to corn, soybeans, small grain, and meadow and pasture plants. Capability unit I-1.

Vincennes Series

The Vincennes series consists of deep, poorly drained, nearly level to depressional soils on stream terraces. These soils formed in loamy materials of mixed origin under a native vegetative cover of swamp forest and marsh grasses.

In a representative profile the surface layer is about 10 inches of dark-gray loam. The subsoil is about 40 inches thick. The upper 8 inches of the subsoil is gray, friable light clay loam that has a few yellowish-brown mottles; the middle part is gray, firm clay loam that has yellowish-brown mottles; the lower part is grayish-brown, friable sandy clay loam that has strong-brown mottles. The underlying material is brown, loose fine sand.

Vincennes soils have high available water capacity and slow permeability. They are subject to ponding.

Representative profile of Vincennes loam in a cultivated field at a point 280 feet east and 260 feet north of the southwest corner of NW¼NW¼ secv. 17, T. 13 N., R. 8 W.:

Ap—0 to 10 inches, dark-gray (10YR 4/1) loam; moderate, medium, granular structure; friable; common fine manganese and iron oxide concretions; neutral; abrupt, smooth boundary.

B1g—10 to 18 inches, gray (10YR 5/1) light clay loam; few, fine, distinct, yellowish-brown (10YR 5/8) mottles; moderate, medium, subangular blocky structure; friable; common fine manganese and iron oxide concretions; strongly acid; clear, smooth boundary.

B2g—18 to 40 inches, gray (10YR 5/1) clay loam; common, fine, distinct, yellowish-brown (10YR 5/8) mottles; moderate, medium, prismatic structure parting to moderate, medium and coarse, subangular and angular blocky structure; firm; thin dark-gray (10YR 4/1) coatings on most peds (do not appear to be clay films when dried; the coatings are porous and sand grains are not coated); common fine manganese and iron oxide concretions; strongly acid; clear, wavy boundary.

B3g—40 to 50 inches, grayish-brown (10YR 5/2) sandy clay loam; common, medium, distinct, strong-brown (7.5YR 5/8) mottles; weak, coarse, subangular blocky structure; friable; strongly acid; clear, wavy boundary.

IIC—50 to 70 inches, brown (10YR 5/3) fine sand; single grained; loose; medium acid.

Thickness of the solum ranges from 40 to 60 inches. The Ap horizon ranges from dark grayish brown to dark gray. The B2 horizon dominantly is clay loam but, in some places, ranges from loam to sandy clay loam or silty clay loam. The B2 horizon is strongly acid to very strongly acid.

Vincennes soils have drainage similar to that of Petrolia soils and are associated with Rensselaer soils. They have a lighter colored surface layer and are more acid than Rensselaer soils, and unlike those soils, they lack clay films in the B horizon. Vincennes soils are more acid and have a higher content of sand than Petrolia soils.

Vincennes loam (0 to 2 percent slopes) (Vn).—This soil is in nearly level to depressional areas on stream terraces. Included with it in mapping are a few areas of soils that are less acid than is typical for the series. Also included are a few areas of soils that have a clay loam surface layer.

Wetness and ponding are the major limitations in the use and management of this soil.

This soil is suited to all crops common to the county if a suitable drainage system is established and maintained. Capability unit IIw-1.

Wakeland Series

The Wakeland series consists of deep, somewhat poorly drained, nearly level soils on bottom lands. These soils formed in loamy alluvium. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is about 8 inches of brown silt loam that has a few pale-brown and grayish-brown mottles. The subsoil, about 30 inches thick, is grayish-brown and light brownish-gray, friable silt loam that is mottled with yellowish brown. It is medium acid in the upper part and neutral in the lower part. The underlying material is mottled light brownish-gray and yellowish-brown, stratified silt loam that contains layers of fine or very fine sand. Reaction in the underlying material is neutral.

Wakeland soils have high available water capacity and moderate permeability. They are subject to flooding.

Representative profile of Wakeland silt loam in a cultivated field at a point 75 feet east and 20 feet north of the southwest corner of NW¼NE¼ sec. 2, T. 12 N., R. 8 W.:

Ap—0 to 8 inches, brown (10YR 5/3) silt loam; few, fine, faint, pale-brown (10YR 6/3) and grayish-brown (10YR 5/2) mottles; weak, medium, granular structure; neutral; abrupt, smooth boundary.

B1—8 to 16 inches, grayish-brown (10YR 52) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6), light yellowish-brown (10YR 6/4), and brown (7.5YR 4/4) mottles; weak, fine, subangular blocky structure; friable; few black (10YR 2/1) iron and manganese oxide concretions; medium acid; clear, wavy boundary.

B21—16 to 28 inches, light brownish-gray (10YR 6/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6, 10YR 5/8) mottles; weak, medium and coarse, subangular blocky structure; friable; few black (10YR 2/1) iron and manganese oxide concretions; medium acid; clear, wavy boundary.

B22—28 to 38 inches, grayish-brown (10YR 5/2) and light brownish-gray (10YR 62) silt loam; many, medium, distinct, yellowish-brown (10YR 5/4) and light yellowish-brown (10YR 6/4) mottles; weak, coarse, subangular blocky structure; friable; few black (10YR 2/1) iron and manganese oxide concretions; slightly acid; clear, wavy boundary.

C—38 to 72 inches, mottled light brownish-gray (10YR 6/2), grayish-brown (10YR 5/2), and yellowish-brown (10YR 5/4), stratified silt loam that contains layers of fine or very fine sand; some layers approach light silty clay loam; massive; friable; few black (10YR 2/1) iron and manganese oxide concretions; neutral.

The Ap horizon ranges from dark grayish brown to grayish brown or brown. The B horizon ranges from gray or light brownish gray to brown and has many gray and yellowish-brown mottles. It ranges from medium acid to neutral. The underlying material ranges from light silty clay loam to silt loam that contains strata of light sandy clay loam, loam, sandy loam, or fine sand. Reaction below a depth of about 3 feet is slightly acid to neutral.

Wakeland soils are associated with Petrolia and Shoals soils. They contain less clay than Petrolia soils and are better drained. They contain less clay and sand than Shoals soils.

Wakeland silt loam (0 to 2 percent slopes) (Wa).—This soil is on bottom lands. Included with it in mapping are small areas of more sandy soils.

Wetness and flooding are limitations to the use and management of this soil.

This soil is suited to row crops and to meadow and pasture plants if a suitable drainage system is established and maintained. Alfalfa and small grain are subject to severe damage during prolonged periods of flooding. Capability unit IIw-7.

Warsaw Series

The Warsaw series consists of deep, well-drained, nearly level to gently sloping soils on outwash terraces. These soils formed in loamy glacial outwash and the underlying calcareous sand and gravel. The native vegetation was mainly grasses.

In a representative profile the surface layer is about 12 inches thick. The upper 8 inches of this layer is black sandy loam, and the lower part is very dark brown gravelly sandy clay loam. The subsoil is about 33 inches thick. The upper part of the subsoil is dark-brown, firm clay loam; the middle part is dark yellowish-brown and brown, friable gravelly sandy clay loam that grades to gravelly sandy loam; and the lower part is brown, friable gravelly sandy clay loam that has a very irregular lower boundary (fig. 14). The underlying material is pale-brown, stratified, calcareous, loose gravel and sand.

Warsaw soils have moderate to low available water capacity. They have moderate permeability in the subsoil and rapid permeability in the underlying material.

Representative profile of Warsaw sandy loam, 0 to 2 percent slopes, at the edge of a gravel pit 480 feet west and 320 feet south of the northeast corner of sec. 4, T. 10 N., R. 10 W.:

Ap—0 to 8 inches, black (10YR 2/1) sandy loam, very dark brown (10YR 2/2) crushed; weak, medium, granu-

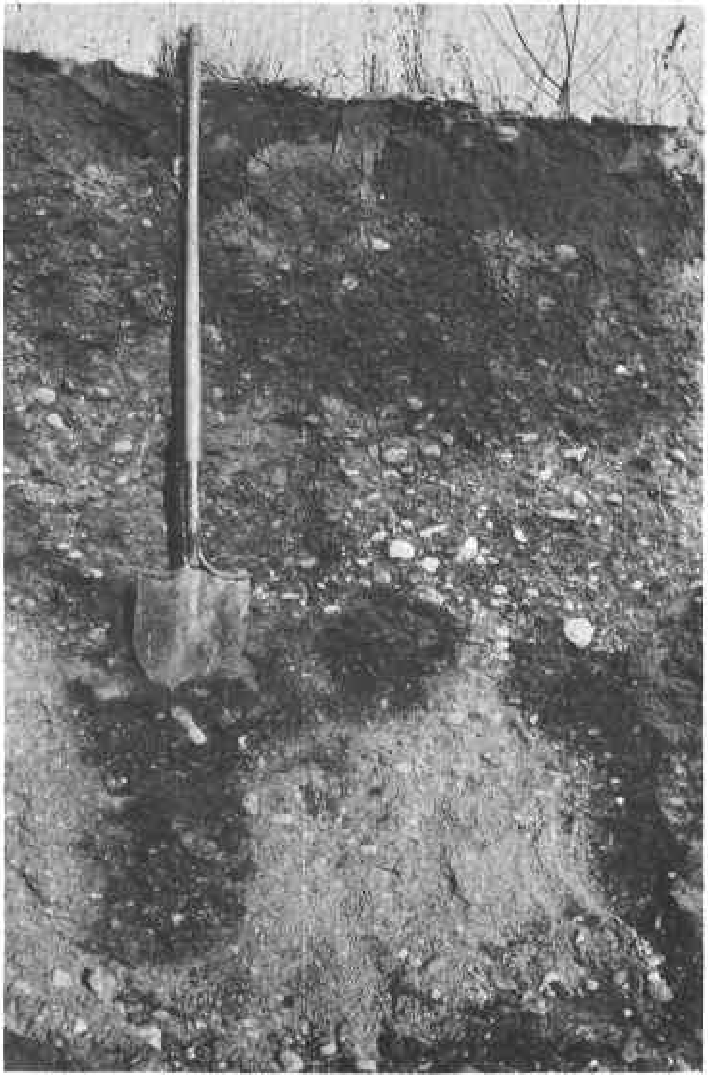


Figure 14.**—Profile of a Warsaw sandy loam. Some of the lower part of the subsoil extends as tongues into the underlying gravel and sand.**

lar structure; very friable; 5 percent gravel; neutral; abrupt, smooth boundary.

A1—8 to 12 inches, very dark brown (10YR 2/2) gravelly sandy clay loam; moderate, medium, granular structure; friable; 25 to 30 percent gravel; slightly acid; clear, wavy boundary.

B21t—12 to 17 inches, dark-brown (7.5YR 3/2) clay loam; moderate, fine and medium, subangular blocky structure; firm; thin, discontinuous, dark reddish-brown (5YR 3/2) films around pebbles and faces of peds; 15 to 18 percent gravel; medium acid; clear, wavy boundary.

B22t—17 to 25 inches, dark yellowish-brown (10YR 3/4) gravelly sandy clay loam, brown (7.5YR 4/4) when rubbed; weak, medium, subangular blocky structure; friable; thin, continuous, dark-brown (7.5YR 3/2) clay films around pebbles and faces of peds; 40 percent gravel, pebbles as much as 3 inches in diameter; medium acid; clear, wavy boundary.

B23t—25 to 35 inches, brown (7.5YR 4/4) gravelly sandy clay loam; weak, medium and coarse, subangular blocky structure; friable; thin, discontinuous, dark yellowish-brown (10YR 3/4) clay films around pebbles and faces of peds; 40 percent gravel; slightly acid; clear, wavy boundary.

B31t—35 to 40 inches, brown (7.5YR 4/4) gravelly sandy loam; weak, coarse, subangular blocky structure; friable; few, thin, discontinuous, dark-brown (7.5YR 3/2) clay films on faces of peds and pebbles; 35 to 40 percent gravel, pebbles as much as 2 inches in diameter; slightly acid; clear, irregular boundary.

IIB32t—40 to 45 inches, brown (7.5YR 4/4) gravelly sandy clay loam; weak, coarse, subangular blocky structure; friable; thin, continuous, dark yellowish-brown (10YR 3/4) clay films on pebbles; 50 to 60 percent gravel, pebbles as much as 4 inches in diameter; neutral; abrupt, irregular boundary.

IIC—45 to 80 inches, pale-brown (10YR 6/3) stratified gravel and sand; single grained; loose; moderately alkaline and calcareous.

The Ap horizon ranges from black to very dark grayish brown. The B2 horizon is clay loam or gravelly clay loam to sandy clay loam or gravelly sandy clay loam, but in places it contains thin layers of loam or silty clay loam. The content of gravel is commonly more than 35 percent in the B horizon and ranges up to 65 percent in the lower part of this horizon. In places part of the B horizon extends as tongues into the C horizon for several feet. The depth to the underlying calcareous gravel and sand ranges from 36 to 60 inches, except where tongues of the B horizon extend to a greater depth into the C horizon.

Warsaw soils have drainage similar to that of Elston and Fox soils. They are underlain by calcareous sand and gravel and contain more clay in the subsoil than Elston soils. They are darker colored and contain more organic matter in the Ap horizon than Fox soils.

Warsaw sandy loam, 0 to 2 percent slopes (WrA).—This soil is on outwash terraces. It has the profile described as representative for the series. Included in mapping are a few small areas that have a loam surface layer and small areas of the more sandy Elston soils.

Moderate to low available water capacity is the major limitation to the use and management of this soil.

This soil is suited to all crops commonly grown in the county. It is well suited to irrigation, and this practice may be used to advantage on such vegetable crops as tomatoes, green beans, and potatoes. During prolonged dry periods, nonirrigated crops are subject to damage from drought. Planting early in spring helps to avoid crop damage from drought. Capability unit IIIs-2.

Warsaw sandy loam, 2 to 6 percent slopes, eroded (WrB2).—This soil is mainly near drainageways or on short breaks in terrace areas. Slopes generally are short. The soil has a profile similar to the one described as representative for the series, except that its surface layer is thinner. Included in mapping are a few small areas with a loam surface layer and a few small areas of more severely eroded Warsaw soils.

The risk of erosion and the moderate to low available water capacity are limitations to the use and management of this soil.

This soil is suited to all crops commonly grown in the county. Such irrigated vegetable crops as potatoes, tomatoes, and green beans are well suited. During prolonged dry periods, nonirrigated crops are subject to damage from drought. Planting early in spring helps to avoid damage from drought. Capability unit IIIe-13.

Washtenaw Series

The Washtenaw series is made up of deep, very poorly drained, nearly level to depressional soils on stream terraces, in outwash areas, and on till plains. These soils consist of recent loamy alluvium over a buried, very poorly drained soil. The native vegetation was forest mixed with swamp grasses and sedges.

In a representative profile the surface layer is about 8 inches of dark grayish-brown silt loam. The subsoil, about 14 inches thick, is dark grayish-brown, friable silt loam that is mottled with yellowish brown and brown. The underlying material is a buried soil that has three different layers. The upper layer, which is an old surface layer, is very dark gray, firm silty clay loam; the next layer is dark-gray, firm silty clay loam; and the lower layer is gray, firm clay loam. All of the underlying layers have some mottles of yellowish brown or dark yellowish brown.

Washtenaw soils have high available water capacity and slow permeability. They are subject to ponding or flooding.

Representative profile of Washtenaw silt loam in a cultivated field at a point 75 feet north and 200 feet west of the center of NW¼ sec. 4, T. 13 N., R. 8 W.:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable; neutral; abrupt, smooth boundary.

C1—8 to 22 inches, dark grayish-brown (10YR 4/2) silt loam; few, fine, faint, brown (10YR 5/3) and yellowish-brown (10YR 5/4, 10YR 5/6) mottles; very weak, medium and coarse, granular structure; friable; neutral; clear, wavy boundary.

IIAb—22 to 36 inches, very dark gray (10YR 3/1) silty clay loam; few, fine, faint, dark yellowish-brown (10YR 4/4) mottles; moderate, medium, subangular blocky structure; firm; neutral; clear, wavy boundary.

IIB2gb—36 to 52 inches, dark-gray (10YR 4/1) silty clay loam; few, fine, faint, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/6) mottles; moderate, medium, angular blocky structure; firm; very dark gray (10YR 3/1) organic coats on faces of peds; neutral; clear, wavy boundary.

IICg—52 to 64 inches, gray (10YR 5/1) clay loam; common, fine, distinct, yellowish-brown (10YR 5/4, 10YR 5/6) mottles; massive; firm; root channels filled with very dark gray (10YR 3/1) silty clay loam; neutral.

The Ap horizon ranges from dark gray to grayish brown. Thickness of the overwash ranges from 20 to 40 inches. Texture is dominantly silt loam, but thin layers of loamy material are in some areas. The Ab horizon is black to very dark gray and ranges from silt loam to silty clay loam or clay loam. The IIB2gb horizon ranges from dark gray to light gray and is mottled. The underlying material ranges from till to outwash sand and gravel.

Washtenaw soils are similar to Shoals soils, except that they are underlain by a dark-colored, buried soil at a depth of 20 to 40 inches and are more poorly drained.

Washtenaw silt loam (0 to 2 percent slopes) (Ws).—This soil is in nearly level to slightly depressional areas on stream terraces, in outwash areas, and on till plains. Included in mapping are a few small areas of soils that have a loam surface layer. Also included are a few small areas of soils where the overwash is less than 20 inches thick.

Wetness, ponding, and flooding are the major limitations to the use and management of this soil.

This soil is suited to most crops commonly grown in the county if a suitable drainage system is established and maintained. Corn, soybeans, small grain, and grasses and legumes are the main crops. The suitability of legumes depends on the adequacy of drainage. Capability unit IIw-1.

Westland Series

The Westland series consists of deep, very poorly drained, nearly level to slightly depressional soils on outwash and stream terraces. These soils formed in 3½ feet or more of loamy glacial drift or alluvium and are underlain by gravel and sand. The native vegetation was water-tolerant trees and grasses.

In a representative profile the surface layer is about 18 inches thick. The upper 8 inches of this layer is very dark gray light clay loam, and the lower 10 inches is black clay loam. The subsoil is about 54 inches thick. The upper 25 inches of the subsoil is dark-gray and grayish-brown, very firm heavy clay loam that has yellowish-brown mottles; the next 10 inches is grayish-brown, firm heavy clay loam that has yellowish-brown mottles; the next 10 inches is grayish-brown, firm gravelly light clay loam that has light olive-brown and yellowish-brown mottles; and the lower 19 inches is grayish-brown, stratified sandy loam and sandy clay loam that is very friable to loose and is mottled with yellowish brown. The underlying material is grayish-brown, stratified, loose gravel and sand.

Westland soils have high available water capacity and slow permeability. They are subject to ponding.

Representative profile of Westland clay loam in a cultivated field at a point 280 feet south and 400 feet east of the northwest corner of NE¼NE¼ sec. 2, T. 10 N., R. 10 W.:

Ap—0 to 8 inches, very dark gray (10YR 3/1) light clay loam; moderate, medium, granular structure; firm; 2 to 5 percent gravel; neutral; abrupt, smooth boundary.

A12—8 to 18 inches, black (10YR 2/1) clay loam; weak, medium, subangular blocky structure; firm; 10 percent gravel; neutral; clear, wavy boundary.

B21tg—18 to 30 inches, dark-gray (10YR 4/1) heavy clay loam; few, medium, distinct, yellowish-brown (10YR 5/6, 10YR 5/8) mottles; weak, medium, prismatic structure parting to moderate, medium, angular blocky structure; very firm; medium, continuous, very dark gray (10YR 31) clay films on faces of peds; 10 to 15 percent gravel; neutral; gradual, wavy boundary.

B22tg—30 to 43 inches, grayish-brown (2.5YR 5/2) and dark-gray (10YR 4/1) heavy clay loam; common, medium, distinct, yellowish-brown (10YR 5/6, 10YR 5/8) and light olive-brown (2.5YR 5/6) mottles; weak, coarse, prismatic structure parting to moderate, coarse, angular blocky structure; very firm; thin very dark gray (10YR 3/1) clay films that are continuous on vertical faces of peds and discontinuous on horizontal faces of peds; 15 to 18 percent gravel; neutral; gradual, wavy boundary.

B31tg—43 to 53 inches, grayish-brown (2.5YR 5/2) gravelly light clay loam; many, coarse, distinct, light olive-brown (2.5YR 5/6) and yellowish-brown (10YR 5/6, 10YR 5/8) mottles; weak, coarse, subangular blocky structure; firm; thin, discontinuous, very dark gray (10YR 3/1) clay films on faces of peds; 25 percent gravel; neutral; clear, wavy boundary.

B32g—53 to 72 inches, grayish-brown (10YR 5/2) stratified sandy loam and sandy clay loam; few, fine, faint, yellowish-brown (10YR 5/4, 10YR 5/6) mottles; massive; very friable to loose; neutral; clear, wavy boundary.

IICg—72 to 82 inches, grayish-brown (10YR 5/2) stratified sand and gravel; single grained; loose; neutral.

The Ap horizon ranges from black to very dark gray. The B horizon ranges from dark gray to grayish brown or olive gray and is mottled with yellowish brown and shades of olive. The B2 horizon typically ranges from heavy clay loam to light clay loam and in places contains 5 to 25 percent gravel. Thin layers of silty clay loam or sandy clay loam to loam are present in some places. The B3 horizon ranges from gravelly clay loam to stratified layers of sandy loam and sandy clay loam.

Westland soils have drainage similar to that of Ragsdale and Rensselaer soils. They are underlain by sand and gravel and are less silty than Ragsdale soils. They contain more gravel in the subsoil and underlying material than Rensselaer soils.

Westland clay loam (0 to 2 percent slopes) (Wt).—This soil is in nearly level to slightly depressional areas on outwash and stream terraces. Included in mapping are a few small areas of soils that have a silty clay loam surface layer and a few small areas of soils that are covered with as much as 8 inches of loam overwash. Also included are a few small areas of Rensselaer and Crane soils.

Wetness and ponding are the major limitations to the use and management of this soil.

This soil is suited to corn, soybeans, and small grain if an adequate drainage system is established and maintained. It also is suited to permanent pasture plants and trees that are tolerant to wetness. Capability unit IIw-1.

Whitaker Series

The Whitaker series consists of deep, somewhat poorly drained, nearly level soils on stream and outwash terraces. These soils formed in stratified loamy alluvium or outwash material under a native vegetative cover of mixed hardwood trees.

In a representative profile the surface layer is about 13 inches of loam. The upper part of this layer is grayish brown, and the lower part is light brownish gray. The subsoil is about 30 inches thick. It is mottled, brown, grayish brown, yellowish brown, and gray and is predominantly firm clay loam. The underlying material is mottled, stratified loam and clay loam that grades to loamy sand and fine sand.

Whitaker soils have high available water capacity and moderate permeability.

Representative profile of Whitaker loam in a cultivated field at a point 400 feet east and 10 feet south of the northwest corner of sec. 17, T. 13 N., R. 8 W.:

Ap—0 to 9 inches, grayish-brown (10YR 5/2) loam; weak, fine, granular structure; friable; neutral; abrupt, smooth boundary.

A2—9 to 13 inches, light brownish-gray (10YR 6/2) loam; weak, medium, platy structure; friable; neutral; clear, wavy boundary.

B1t—13 to 17 inches, brown (10YR 5/3) light clay loam; common, fine, faint, dark yellowish-brown (10YR 4/4) mottles; weak, medium, subangular blocky structure; firm; thin, discontinuous, dark-gray (10YR 4/1) clay films on faces of peds; few, fine, black (10YR 2/1) iron and manganese oxide concretions; strongly acid; clear, wavy boundary.

B21tg—17 to 28 inches, mottled grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) clay loam; moderate, medium and coarse, subangular blocky structure; firm; thin, discontinuous, dark-gray (10YR 4/1) clay films on faces of peds; few, fine, black (10YR 2/) iron and manganese oxide concretions; strongly acid; clear, wavy boundary.

B22tg—28 to 33 inches, light-gray (10YR 6/1) and light brownish-gray (10YR 6/2) loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, coarse, subangular blocky structure; friable; few, thin, discontinuous, dark-gray (10YR 4/1) clay films on faces of peds; few, medium, black (10YR 2/1) iron and manganese oxide concretions; strongly acid; clear, wavy boundary.

B3g—33 to 43 inches, gray (10YR 5/1) clay loam; common, medium, distinct, brown (7.5YR 4/4) and yellowish-brown (10YR 5/6) mottles; weak, coarse, subangular blocky structure; firm; few, medium, black (10YR 2/1) iron and manganese oxide concretions; strongly acid; clear, wavy boundary.

C1g—43 to 66 inches, grayish-brown (10YR 5/2) stratified loam and clay loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; massive; friable; few, medium, black (10YR 2/1) iron and manganese oxide concretions; strongly acid; gradual, wavy boundary.

IIC2g—66 to 112 inches, grayish-brown (10YR 5/2) stratified loamy sand and fine sand; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; single grained; friable to loose; strongly acid.

The Ap horizon ranges from dark grayish brown to grayish brown. The B2 horizon ranges from clay loam to loam that has thin layers ranging from sandy loam to silty clay loam. The B horizon ranges mainly from mottled gray and grayish brown to olive gray, but a thin layer that is mottled brown or dark yellowish brown is present in the upper part. The C horizon is mottled grayish brown or gray and has stratified layers ranging from silt to sand and thin layers of clayey material in places.

Whitaker soils are associated with Camden and Rensselaer soils. They are more poorly drained and contain more sand in the B horizon than Camden soils. They have a lighter colored surface layer that is lower in content of organic matter than Rensselaer soils, and they are naturally better drained than those soils.

Whitaker loam (0 to 2 percent slopes) (Wx).—This soil is on stream terraces and in outwash areas. Included with it in mapping are a few small areas of soils that have a silt loam or a sandy loam surface layer.

Wetness is the major limitation to the use and management of this soil.

This soil is suited to corn, soybeans, small grain, and meadow, and pasture plants if a suitable drainage system is established and maintained. Capability unit IIw-2.

Xenia Series

The Xenia series consists of deep, moderately well drained, gently sloping soils on uplands. These soils formed in loess and the underlying glacial till. The mantle of loess is about 2 to 3 feet thick. The native vegetation was mainly mixed hardwood trees.

In a representative profile the surface layer is about 8 inches of dark grayish-brown silt loam. The subsoil is about 47 inches thick. The upper part of the subsoil is yellowish-brown, firm silty clay loam that is mottled with light brownish gray at a depth of about 15 inches. The lower part is yellowish-brown, firm clay loam that has some pebbles and is mottled with shades of gray. The underlying material is brown and yellowish-brown firm, calcareous loam till that is mottled with shades of gray and pale brown. A few rocks and many pebbles are present in the till.

Xenia soils have high available water capacity and moderately slow permeability.

Representative profile of Xenia silt loam, 2 to 6 percent slopes, eroded, in a pasture at a point 320 feet west and 320 feet south of the northeast corner of SE¼SW¼ sec. 22, T. 13 N., R. 10 W.:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable; some yellowish-brown (10YR 5/4, 10YR 5/6) material from the B horizon is mixed into this horizon; neutral; abrupt, smooth boundary.

B21t—8 to 15 inches, yellowish-brown (10YR 5/4, 10YR 5/6) light silty clay loam; moderate, fine, subangular blocky structure; firm; thin, discontinuous, brown (10YR 4/3) clay films on faces of peds; some light-gray (10YR 7/1) silt coats on a few peds; few, very fine, very dark brown (10YR 2/2) iron and manganese concretions; strongly acid; clear, wavy boundary.

B22t—15 to 26 inches, yellowish-brown (10YR 5/6) silty clay loam; common, fine and medium, distinct, light brownish-gray (10YR 6/2) mottles; moderate, fine and medium, subangular blocky structure; firm; thin, discontinuous, brown (10YR 4/3) and yellowish-brown (10YR 5/4) clay films on faces of peds; common, fine and medium, very dark brown (10YR 2/2) iron and manganese concretions; strongly acid; clear, wavy boundary.

IIB23t—26 to 33 inches, yellowish-brown (10YR 5/6, 10YR 5/8) light clay loam; many, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak to moderate, medium, subangular blocky structure; firm; thin, discontinuous, brown (10YR 4/3) clay films on faces of peds; few fine to coarse pebbles as much as ¾ inch in diameter; few, fine, very dark brown (10YR 2/2) iron and manganese concretions; strongly acid; gradual, wavy boundary.

IIB3—33 to 55 inches, yellowish-brown (10YR 5/4, 10YR 5/6) clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) and grayish-brown (10YR 5/2) mottles; weak, coarse, subangular blocky structure becoming massive in lower part; firm; many pebbles; few, fine, very dark brown (10YR 2/2) iron and manganese concretions; few small stones; slightly acid; gradual, wavy boundary.

IIC—55 to 90 inches, brown (10YR 5/3) and yellowish-brown (10YR 5/4) loam; many, fine, faint, light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) mottles; massive; firm; many sharp and rounded pebbles and a few stones; some very dark brown (10YR 2/2) splotches in upper part of horizon and some strong-brown (7.5YR 5/8) splotches in lower part; moderately alkaline and calcareous.

The thickness of the solum and the depth to calcareous till commonly are about 50 inches but range from 42 to 60 inches in places. The Ap horizon ranges in color from dark grayish brown to dark yellowish brown. The B horizon ranges from light silty clay loam in the upper part to silty clay loam that feels gritty or clay loam in the lower part. The B horizon ranges from dark yellowish brown and yellowish brown to dark brown. The upper part of the B horizon is free of mottles, but the B horizon is mottled with grayish brown to gray within a depth of 10 inches of the top of the B2t horizon. The thickness of the loess cap ranges from 22 to 40 inches. The C horizon is typically loam to light clay loam calcareous till.

Xenia soils have drainage similar to that of Muren soils and are associated with Russell soils. They formed both in loess and in glacial till, but Muren soils formed entirely in loess. Xenia soils are less well drained than Russell soils and are mottled in the B horizon.

Xenia silt loam, 2 to 6 percent slopes, eroded (XeB2).—This soil is along drainageways and on short breaks adjacent to ridgetops. The plow layer is a mixture of the original surface layer and some of the yellowish-brown subsoil. Included in mapping are small areas of Xenia soils that are either more eroded or less eroded than this Xenia soil and some small areas of the well-drained Russell soils. Also included are a few areas of the somewhat poorly drained Fincastle soils.

Runoff and the risk of erosion are the major limitations to the use and management of this soil.

This soil is suited to all cultivated crops commonly grown in the county. It also is suited to permanent pasture plants and trees. Capability unit IIe-3.

Zipp Series

The Zipp series consists of deep, very poorly drained, nearly level to slightly depressional soils. These soils formed in lacustrine material on terraces and in slackwater areas on bottom lands. The native vegetation was mixed swamp forest and swamp grasses.

In a representative profile the surface layer is about 8 inches of dark-gray silty clay. The subsoil is about 40 inches thick. It is dark-gray, firm silty clay that is mottled with yellowish brown. The underlying material is gray and olive-gray, stratified silty clay and silty clay loam that is mottled with olive brown.

Zipp soils have moderate available water capacity and very slow permeability. They are subject to flooding.

Representative profile of Zipp silty clay in a wooded area at a point 100 feet east and 80 feet south from the northwest corner of NE¼SW¼ sec. 19, T. 10 N., R. 10 W.:

Ap—0 to 8 inches, dark-gray (10YR 4/1) silty clay; dark grayish brown (2.5YR 4/2) crushed and light brownish gray (10YR 6/2) when dry; moderate, fine, granular structure; firm; neutral; abrupt, smooth boundary.

B21g—8 to 18 inches, dark-gray (5Y 4/1) silty clay; few, fine, faint, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; distinct pressure faces on some peds; few, fine, black (10YR 2/1) iron and manganese oxide concretions; neutral; clear, wavy boundary.

B22g—18 to 25 inches, dark-gray (5Y 4/1) silty clay; common, fine, faint, yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 4/4) mottles; moderate, medium, angular blocky structure; very firm; distinct pressure faces on some peds; few, fine, black (10YR 2/1) iron and manganese oxide concretions; neutral; gradual, wavy boundary.

B23g—25 to 35 inches, dark-gray (5Y 4/1) silty clay; common, medium, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; moderate, medium and coarse, angular blocky structure; very firm; dark-gray (10YR 4/1) pressure faces; few, fine, black (10YR 2/1) iron and manganese oxide concretions; neutral; gradual, wavy boundary.

B3g—35 to 48 inches, dark-gray (5Y 4/1) light silty clay; common, medium, distinct, yellowish-brown (10YR 5/6) and light olive-brown (2.5YR 5/4, 2.5YR 5/6) mottles; weak, coarse, angular and subangular blocky structure; very firm; few, thin, dark-gray (10YR 4/1) pressure faces; few, fine, black (10YR 2/1) iron and manganese oxide concretions; neutral; gradual, wavy boundary.

Cg—48 to 65 inches, gray (10YR 5/1) and olive-gray (5Y 4/2), stratified silty clay and silty clay loam; common, medium, distinct, olive-brown (2.5Y 4/4) and yellowish-brown (10YR 5/6, 10YR 5/8) mottles; massive; firm; common, fine, black (10YR 2/1) iron and manganese oxide concretions; few pebbles; neutral.

The Ap horizon ranges from dark grayish brown to dark gray. The B2 horizon ranges from dark gray to gray and is mottled with yellowish brown or shades of olive. The underlying material is mainly silty clay loam to clay, but thin layers of clay loam and an occasional layer of sandy clay loam are present in some places.

Zipp soils are associated with Petrolia and Sloan soils. They have a higher content of clay than those soils.

Zipp silty clay (0 to 2 percent slopes) (Zp).—This soil is in depressional areas on terraces, on old river channels, and in slack water areas. Included in mapping are small areas of soils that have a clay loam or silty clay loam surface layer. Also included is an area of soils, in the northwestern corner of Linton Township, that have a darker colored surface layer than this Zipp soil.

Wetness and flooding are the major limitations to the use and management of this soil.

This soil is suited to corn, soybeans, meadow, and pasture plants if a suitable drainage system is established and maintained. Alfalfa and small grain are subject to severe damage from flooding in winter and spring. Capability unit IIIw–2.

Use and Management of the Soils

This section gives information on the use and management of the soils in Vigo County for cropland, woodland, wildlife, recreation, engineering structures and practices, and town and country planning. It also gives the capability grouping of soils and predicted yields for important crops.

Specific management for individual soils is not suggested in this section. Detailed information on use and management can be obtained from the local office of the Soil Conservation Service or the Vigo County Cooperative Extension Service.

Use of the Soils for Cropland

About 63 percent of the acreage in Vigo County is used for cropland and pasture. The main crops are corn, soybeans, small grain, grain sorghum, and meadow plants, and a small acreage is in special crops.

Some of the major concerns of management in this county are wetness, soil blowing, water erosion, maintenance of fertility and organic-matter content, and maintenance of good tilth or improvement of tilth. Of the intensively cultivated acreage, about 57 percent is limited by wetness, 17 percent by droughtiness, and 11 percent by the erosion hazard. Only 15 percent of the acreage has few limitations for crops.

The major management practices are the use of suitable tile drainage systems, grassing the waterways, farming on the contour, diversion terracing, grade stabilizing, minimum tillage, and using crop residue, green-manure crops, and winter cover crops. For most of the soils in the county, applications of lime and fertilizer in amounts indicated by tests and field trials also are needed.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are so used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops requiring special management.

Those familiar with the capability classification (*6*) can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or for engineering.

In the capability system, the kinds of soils are grouped at three levels: the capability class, subclass, and unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

> Class I soils have few limitations that restrict their use.
>
> Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
>
> Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.
>
> Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.
>
> Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife. (None in Vigo County.)
>
> Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife.
>
> Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife.
>
> Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or to esthetic purposes. (None in Vigo County.)

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States but not in Vigo County, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–3 or IIIe–12. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages the capability units in Vigo County are described and suggestions for the use and management of the soils are given. These units are not numbered consecutively, because not all of the units in the statewide system are represented in the county. The names of the soil series represented are mentioned in the description of each capability unit, but this does not mean that all soils in a given series appear in the unit. To find the capability unit assigned to any specific soil, refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT I-1

This unit consists of deep, well drained or moderately well drained, nearly level soils of the Camden, Muren, Proctor, and Tippecanoe series. These soils are on uplands and terraces. They have a medium-textured surface layer. The Proctor and Tippecanoe soils have a high organic-matter content, but the Muren and Camden soils have a low to moderate organic-matter content. Areas of soils not limed are medium acid to strongly acid in the surface layer. The soils in this unit generally have high available water capacity and moderate permeability, but the Muren soils have moderately slow permeability.

These soils are suited to all crops commonly grown in the county. Corn, soybeans, small grain, and meadow and pasture plants are the main crops.

These soils have no serious limitations to use and management. The major concerns of management are maintaining the organic-matter content and fertility and maintaining good tilth or improving tilth. Use of minimum tillage, crop residue, and green-manure crops helps to improve and maintain the organic-matter content and tilth. Crops respond well to lime and fertilizer.

CAPABILITY UNIT I-2

This unit consists of deep, well drained to moderately well drained, nearly level soils of the Armiesburg, Eel, and Genesee series and the Genesee series, sandy variant. These soils are on bottom lands along the Wabash river and its tributaries. They have a moderately coarse textured surface layer and subsoil. The Eel and Genesee soils have low to moderate organic-matter content, but the Armiesburg soils have high organic-matter content. Reaction of the surface layer is neutral or slightly acid. These soils generally have moderate permeability and high available water capacity, but the Genesee soils, sandy variant, have moderate available water capacity.

Soils in this unit are suited to most crops commonly grown in the county. Corn, soybeans, grain sorghum, and meadow plants are the main crops. Alfalfa and small grain are subject to severe damage during prolonged periods of flooding. Dikes and levees help to prevent damage from flooding. Damage to crops is likely during prolonged dry periods on the Genesee soils, sandy variant.

Occasional flooding is a limitation to the use and management of these soils. Some areas are protected by levees, but during periods of high water, seepage through levees causes some damage. Because of their moderate available water capacity, Genesee soils, sandy variant, are somewhat droughty. Use of crop residue and green-manure crops helps to improve and maintain the organic-matter content. Crops respond well to additions of fertilizer.

CAPABILITY UNIT IIe-1

This unit consists only of Parke silt loam, 2 to 6 percent slopes, eroded. This deep, well-drained, gently sloping soil is on uplands. It has a medium-textured surface layer and is low to moderate in organic-matter content and natural fertility. The surface layer is strongly acid where it is not limed. This soil has high available water capacity and moderate permeability.

The soil in this unit is suited to all crops commonly grown in the county. Corn, soybeans, small grain, and meadow and pasture plants are the main crops.

Runoff and the risk of erosion are limitations to use and management. The major concerns of management are maintaining the organic-matter content and fertility, improving tilth, and controlling erosion. Use of minimum tillage, crop residue, and green-manure crops helps to improve and maintain the organic-matter content and tilth. These practices and use of terraces, contour cultivation, and grassed waterways help to control runoff and erosion. Crops respond well to additions of lime and fertilizer.

CAPABILITY UNIT IIe-3

This unit consists of deep, well drained and moderately well drained, gently sloping soils of the Alford, Camden, Muren, Russell, and Xenia series. These soils are on uplands and terraces. They have a medium-textured surface layer. They have a low to moderate organic-matter content and natural fertility. The surface layer is strongly acid or medium acid where the soils are not limed. These soils have high available water capacity. Alford, Camden, and Russell soils have moderate permeability, and Muren and Xenia soils have moderately slow permeability.

The soils in this unit are suited to all crops commonly grown in the county. Corn, soybeans, small grain, and meadow and pasture plants are the main crops.

Runoff and the risk of erosion are limitations to use and management. The major concerns of management are maintaining the organic-matter content and fertility, improving tilth or maintaining good tilth, and controlling erosion. Use of minimum tillage, crop residue, and green-manure crops helps to improve and maintain the organic-matter content and tilth. These practices and use of terraces, contour cultivation, and waterways help to control runoff and erosion. Application of lime helps to maintain a favorable reaction in the surface layer. Crops respond well to fertilizer.

CAPABILITY UNIT IIe-7

This unit consists only of Ava silt loam, 2 to 6 percent slopes, eroded. This deep, moderately well drained, gently sloping soil is on uplands. It has a medium-textured surface layer and a moderately fine textured subsoil. A very firm and brittle fragipan is at a depth of about 22 to 32 inches. This soil has a low to moderate organic-matter content and natural fertility. The surface layer is strongly acid where the soil is not limed. The fragipan is very slowly permeable, and it restricts the downward movement of water and the penetration of roots and limits the available water capacity to moderate.

The soil in this unit is suited to most crops commonly grown in the county. Corn, soybeans, small grain, and meadow and pasture plants are the main crops. Alfalfa and other deep-rooted crops are not well suited, because the fragipan restricts the penetration of roots and the movement of water. In years of below-average rainfall or poor rainfall distribution, crops are subject to damage from drought. Wetness early in spring, caused by a perched water table above the fragipan, often delays field work.

Runoff and the risk of erosion are limitations to use and management. The major concerns of management are maintaining the organic-matter content and fertility, maintaining good tilth or improving tilth, and controlling erosion. Use of minimum tillage, crop residue, and green-manure crops helps to maintain or improve the organic-matter content and tilth. These practices and use of terraces, contour cultivation, and grassed waterways help to control runoff and erosion. Applications of lime help to maintain a favorable reaction in the surface layer. Crops respond well to additions of fertilizer.

CAPABILITY UNIT IIe-11

This unit consists only of Princeton fine sandy loam, 2 to 6 percent slopes. This is a deep, well-drained, gently sloping soil on uplands. The soil has a moderately coarse textured surface layer and a medium-textured or moderately fine textured subsoil. It has low to moderate organic-matter content, and it has a medium acid surface layer where it is not limed. It has moderate available water capacity and moderate permeability.

This soil is suited to all crops commonly grown in the county. Corn, soybeans, small grain, and meadow and pasture plants are the main crops. Alfalfa and orchard crops also are well suited.

The risk of erosion and the moderate available water capacity are limitations to the use and management of this soil. During years of below-average rainfall or poor rainfall distribution, crops are subject to damage from drought. The major concerns of management are maintaining the organic-matter content and fertility and controlling erosion. Use of minimum tillage, crop residue, and green-manure crops helps to improve and maintain the organic-matter content and tilth. These practices and the use of contour cultivation, terraces, and grassed waterways help to control erosion. Crops respond well to additions of lime and fertilizer.

CAPABILITY UNIT IIw-1

This unit consists of deep, poorly drained to very poorly drained, nearly level soils of the Ragsdale, Rensselaer, Vincennes, Washtenaw, and Westland series. These soils are in depressions on terraces and uplands. They have a medium-textured to moderately fine textured surface layer. They have a high organic-matter content, and the surface layer is neutral to strongly acid where it is not limed. These soils have high available water capacity and slow permeability.

These soils are suited to all crops commonly grown in the county if a suitable drainage system is established and maintained. Alfalfa is subject to frost heaving in winter and early in spring.

Wetness is the major limitation to the use and management of these soils. Maintaining good tilth is difficult on the moderately fine textured soils. Use of minimum tillage and crop residue and working the moderately fine textured soils at a favorable moisture content help to maintain good tilth. Crops respond well to additions of fertilizer. Crops grown on the Vincennes soil respond to applications of lime.

CAPABILITY UNIT IIw-2

This unit consists of deep, somewhat poorly drained, nearly level to gently sloping soils of the Bartle, Cory, Crane, Fincastle, Iva, Reesville, and Whitaker series. These soils are on uplands and terraces throughout most of the county. They have a medium-textured surface layer. They generally have a low to moderate organic-matter content and natural fertility, but the Cory and Crane soils have a high organic-matter content. The surface layer is medium acid to strongly acid where these soils are not limed. They generally have high available water capacity, but the Bartle soils have moderate available water capacity. Permeability ranges from moderate to very slow. The Crane and Whitaker soils have moderate permeability, and the Bartle soils, which have a fragipan, have very slow permeability. The other soils have slow permeability.

These soils, except for the Bartle soils, are suited to all crops commonly grown in the county if a suitable drainage system is established and maintained. In addition, erosion control practices are needed in the gently sloping areas. Corn, soybeans, small grain, and meadow and pasture plants are the main crops grown. Alfalfa and other deep-rooted crops are not well suited to Bartle soils, because the fragipan restricts growth of roots.

Wetness is the major limitation to the use and management of these soils (fig. 15). The major concerns of management are maintaining the organic-matter content and fertility, improving tilth or maintaining good tilth, maintaining adequate drainage, and controlling erosion in the gently sloping areas. Use of minimum tillage, crop residue, and green-manure crops helps to improve and maintain the organic-matter content and tilth. Crops respond well to additions of lime and fertilizer.

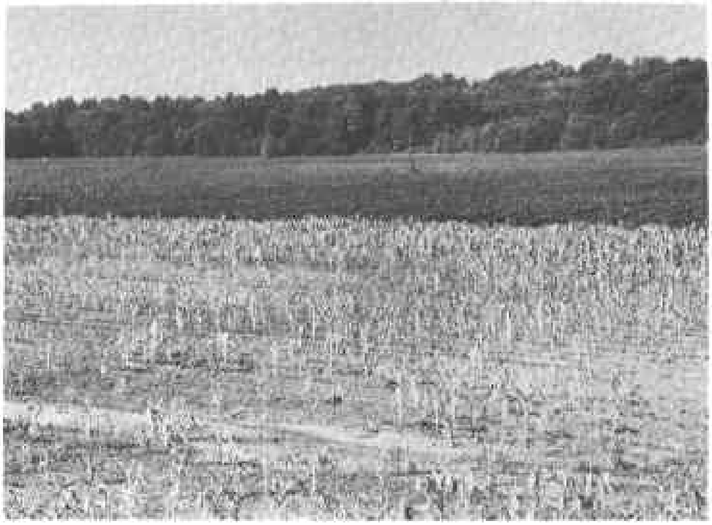


Figure 15.—**Failure of corn on Bartle silt loam because of inadequate drainage.**

CAPABILITY UNIT IIw-7

This unit consists of deep, poorly drained and somewhat poorly drained, nearly level soils of the Petrolia, Shoals, and Wakeland series. These soils are on bottom lands along the Wabash River and its tributaries throughout the county. They have a moderately fine textured or medium-textured surface layer. They have a low to moderate organic-matter content, and the surface layer is medium acid to neutral where the soils are not limed. They generally have high available water capacity and moderate permeability, but the Petrolia soils have slow permeability.

The soils in this unit are suited to corn, soybeans, and meadow and pasture plants if a suitable drainage system is established and maintained. Small grain and alfalfa are subject to severe damage during prolonged periods of flooding.

Flooding and wetness are the major limitations to use and management of these soils. Use of minimum tillage, crop residue, and green-manure crops helps to improve or maintain a favorable organic-matter content and tilth. Crops respond well to additions of fertilizer.

CAPABILITY UNIT IIIe-3

This unit consists of deep, well-drained, moderately sloping soils of the Alford and Russell series. These soils are on uplands. They have a medium-textured surface layer and moderately fine textured subsoil. They have a low to moderate organic-matter content and natural fertility. They are medium acid or strongly acid in the surface layer where they are not limed. The available water capacity is high, and permeability is moderate.

These soils are suited to all crops grown in the county. The main crops are corn, soybeans, small grain, and hay and pasture plants.

Runoff and the risk of erosion are the main limitations to the use and management of these soils. The main concerns of management are controlling erosion, maintaining the organic-matter content and fertility, and maintaining good tilth or improving tilth. Use of minimum tillage, crop residue, and green-manure crops helps to reduce erosion, maintain or increase the organic-matter content, and improve tilth. Contour cultivation, diversions, waterways, and terraces also are needed to reduce runoff and control erosion in places. Crops respond well to additions of lime and fertilizer.

CAPABILITY UNIT IIIe-7

This unit consists only of Cincinnati silt loam, 6 to 12 percent slopes, eroded. This is a deep, well-drained, moderately sloping soil on uplands. It has a medium-textured surface layer and a moderately fine textured subsoil. This soil has a low to moderate organic-matter content and natural fertility, and it has a strongly acid surface layer where it is not limed. A very slowly permeable fragipan is at a depth of 22 to 32 inches. This pan restricts the downward movement of water and the penetration of roots, and it limits the available water capacity to moderate and permeability to very slow.

This soil is suited to all crops commonly grown in the county. The main crops are corn, soybeans, small grain, and hay pasture plants (fig. 16). Alfalfa and other deep-rooted crops are not well suited, because the fragipan restricts penetration of roots and water. Crops are subject to damage from drought in years of below-average rainfall or poor rainfall distribution.

Runoff and the risk of erosion are limitations to the use and management of this soil. The main concerns of management are maintaining good tilth and controlling erosion. Use of minimum tillage and crop residue helps to maintain a favorable organic-matter content and good tilth. These practices and use of terraces, contour cultivation, diversions, and waterways help to control runoff and erosion. Crops respond well to additions of lime and fertilizer.

CAPABILITY UNIT IIIe-12

This unit consists of deep, somewhat excessively drained, moderately sloping soils of the Ade and Bloomfield series. These soils are on terraces and uplands. They have a coarse-textured surface layer and subsoil. Organic-matter content is moderate to high in the Ade soils and moderate in the Bloomfield soils. The soils in this unit have low natural fertility, and the surface layer is medium acid where it is not limed. Available water capacity is low, and permeability is moderately rapid to rapid.

These soils are marginal for cropland. The main crops are corn, soybeans, small grain, grasses for hay and pasture, and such specialty crops as melons and orchard crops. Crops are subject to damage from drought during growing seasons that have low rainfall or poor rainfall distribution.

Droughtiness and the risk of erosion are the main limitations to the use and management of these soils. Use of minimum tillage, crop residue, and green-manure crops is effective in conserving moisture and controlling erosion. Planting early in spring helps to avoid damage to crops from drought. Crops respond well to additions of lime and fertilizer if moisture is adequate.

CAPABILITY UNIT IIIe-13

This unit consists of moderately deep to deep, well-drained, gently sloping soils of the Elston, Fox, and Warsaw series. These soils are on terraces. They have a moderately coarse textured surface layer and a medium-textured or moderately fine textured subsoil. Elston and Warsaw soils have a high organic-matter content and moderate natural fertility. Fox soils have a low to moderate organic-matter content and natural fertility. All the soils have a medium acid or strongly acid surface layer where they are not limed. Available water capacity is moderate to low. Permeability is moderate to moderately rapid in the subsoil. Fox and Warsaw soils have stratified sand and gravel at a depth of 24 to 48 inches or more, and permeability in these materials is rapid.

The soils in this unit are suited to all crops commonly grown in the county. The main crops are corn, soybeans, small grain, grain sorghum, and meadow and pasture plants. Crops are subject to drought damage in years of low rainfall or poor rainfall distribution.

Droughtiness and the risk of erosion are the main limitations to the use and management of these soils. Use of minimum tillage, crop residue, cover crops, and green-manure crops helps to conserve moisture and con-

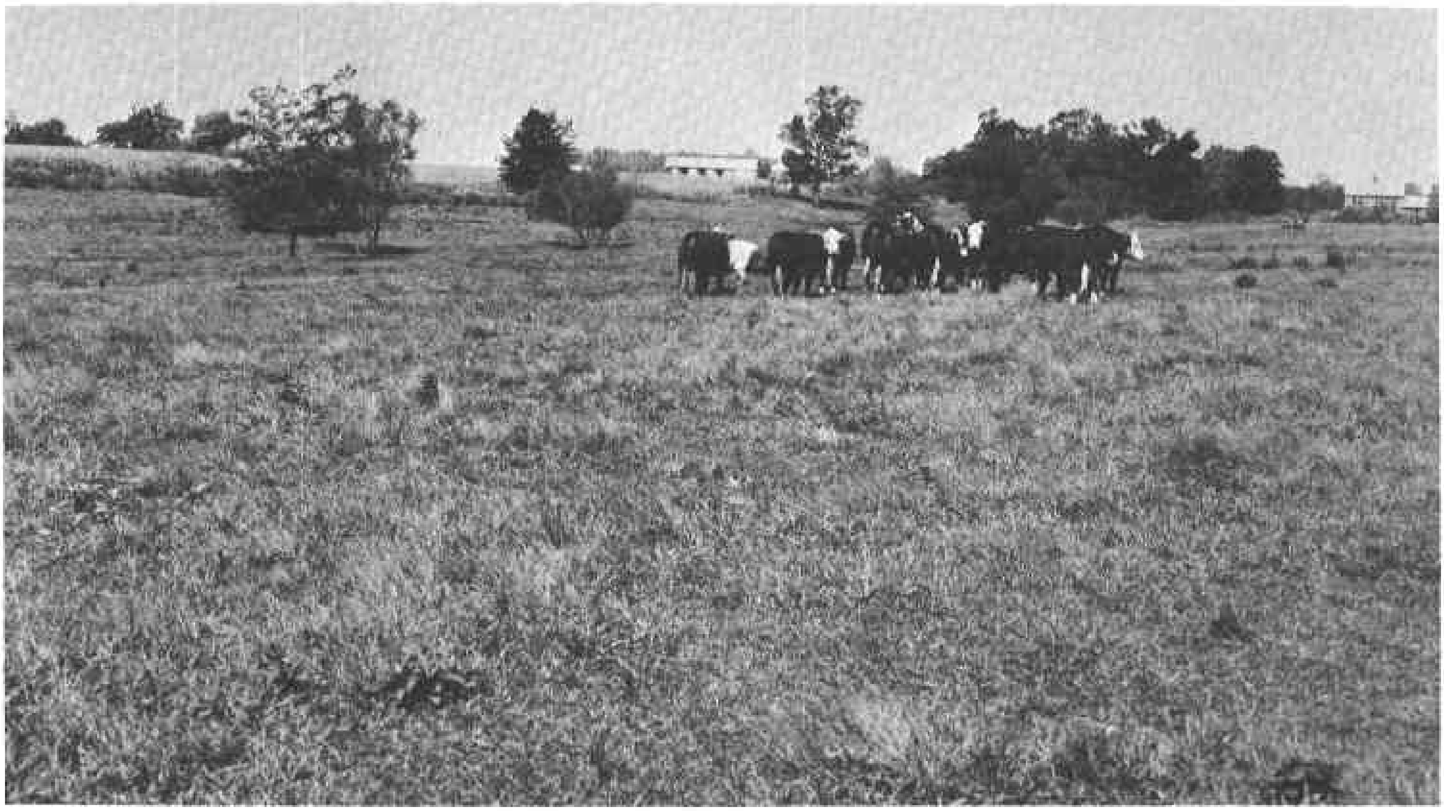


Figure 16.—**Good pasture management on Cincinnati silt loam, 6 to 12 percent slopes, eroded, in capability unit IIIe–7.**

trol erosion. Grassed waterways can be used to help control runoff and erosion in some areas. Crops respond well to additions of lime and fertilizer if moisture is adequate.

CAPABILITY UNIT IIIe–15

This unit consists only of Princeton fine sandy loam, 6 to 12 percent slopes, eroded. This is a deep, well-drained, moderately sloping soil on uplands. It has a moderately coarse textured surface layer and a moderately fine textured subsoil. It is low to moderate in organic-matter content and natural fertility, and it has a strongly acid surface layer where it is not limed. Available water capacity and permeability are moderate.

This soil is suited to all crops commonly grown in the county. The main crops are corn, soybeans, small grain, grain sorghum, and meadow and pasture plants. During years of below-average rainfall or poor rainfall distribution, crops are subject to damage from drought.

Runoff, the risk of erosion, and moderate available water capacity are limitations to the use and management of this soil. The main concerns of management are maintaining the organic-matter content and fertility, maintaining good tilth or improving tilth, and controlling erosion. Contour cultivation, diversions, terraces, and grassed waterways help to reduce erosion and runoff. Use of minimum tillage, crop residue, and cover crops helps to conserve moisture and reduce erosion. Crops respond well to additions of lime and fertilizer if moisture is adequate.

CAPABILITY UNIT IIIw–2

This unit consists only of Zipp silty clay. This is a deep, very poorly drained, nearly level or slightly depressional soil on terraces and bottom lands. It has a fine-textured surface layer and subsoil and is moderate in organic-matter content. The surface layer is slightly acid to neutral where it is not limed. Available water capacity is moderate, and permeability is very slow.

The soil is suited to corn, soybeans, and meadow and pasture plants if a suitable drainage system is established and maintained. Alfalfa and small grain are subject to severe damage from flooding or ponding in winter and spring.

Wetness and flooding or ponding are the major limitations to the use and management of this soil. Use of minimum tillage and crop residue and working the soil at a favorable moisture content help to maintain good tilth. Crops respond to additions of fertilizer.

CAPABILITY UNIT IIIw–4

This unit consists only of Ayrshire fine sandy loam. This is a deep, somewhat poorly drained, nearly level soil on terraces and uplands. It has a moderately coarse textured surface layer and a moderately fine textured subsoil. It has low to moderate organic-matter content and natural fertility. The surface layer is medium acid where it is not limed. Available water capacity is high, and permeability is moderate.

This soil is suited to all crops commonly grown in the county if an adequate drainage system is established and maintained. The main crops are soybeans, small grain, and hay and pasture plants.

Wetness is the major limitation to the use and management of this soil. The main concerns of management are maintaining the organic-matter content and fertility and maintaining good tilth or improving tilth. Use of minimum tillage, crop residue, and green-manure crops helps to improve and maintain the organic-matter content and tilth. Crops respond well to additions of lime and fertilizer.

CAPABILITY UNIT IIIw-5

This unit consists only of Millsdale silty clay loam. This is a moderately deep, very poorly drained, nearly level to slightly depressional soil on rock-cut terraces. It has a moderately fine textured surface layer and subsoil. This soil has a high organic-matter content and natural fertility. The surface layer is slightly acid to neutral where it is not limed. Available water capacity is low to moderate, and permeability is low.

This soil is suited to corn, soybeans, small grain, and grasses and legumes where it is adequately drained.

Wetness, ponding, and the shallow depth to bedrock are major limitations to the use and management of this soil. Use of minimum tillage and crop residue and working the soil at a favorable moisture content help to maintain good tilth. Crops respond well to additions of fertilizer.

CAPABILITY UNIT IIIw-7

This unit consists only of Randolph silt loam, 0 to 3 percent slopes. This is a moderately deep, somewhat poorly drained, nearly level soil. It formed in 20- to 40-inch deposits of loess or glacial drift and residuum from limestone bedrock on rock-cut terraces. It has a medium-textured surface layer and a moderately fine textured and fine textured subsoil. This soil has low to moderate organic-matter content and natural fertility. The surface layer is strongly acid to medium acid where it is not limed. Available water capacity is low to moderate, and permeability is slow.

This soil is suited to all crops commonly grown in the county if an adequate drainage system is established and maintained. The main crops are corn, soybeans, small grain, and hay and pasture plants.

Wetness and the shallow depth to bedrock are the major limitations to the use and management of this soil. The main concerns of management are maintaining the organic-matter content and fertility and maintaining good tilth or improving tilth. Use of minimum tillage, crop residue, and green-manure crops helps to improve and maintain the organic-matter content and tilth. Crops respond well to additions of lime and fertilizer.

CAPABILITY UNIT IIIw-9

This unit consists only of Sloan clay loam. This is a deep, very poorly drained, nearly level to slightly depressional soil on bottom lands. It has a moderately fine textured surface layer and subsoil. This soil has a high organic-matter content and natural fertility. The surface layer is slightly acid to neutral where it is not limed. Available water capacity is high, and permeability is moderate.

This soil is suited to corn and soybeans where it is adequately drained. Alfalfa and small grain are subject to severe damage during prolonged periods of flooding. Undrained areas are better suited to water-tolerant trees than to most other uses.

Wetness and flooding are limitations to the use and management of this soil. Use of minimum tillage, working the soil at a favorable moisture content, and use of crop residue help to maintain good tilth. Crops respond well to additions of fertilizer.

CAPABILITY UNIT IIIs-1

This unit consists of deep, somewhat excessively drained, gently sloping soils of the Ade and Bloomfield series. These soils are on terraces and uplands. They have a coarse-textured surface layer and subsoil. The Ade soils have a moderate to high organic-matter content, and the Bloomfield soils have a moderate organic-matter content. All of these soils have low natural fertility as well as a medium acid surface layer where they are not limed. Available water capacity is low, and permeability is moderately rapid to rapid.

These soils are marginal for crops. The main crops are corn, soybeans, small grain, grasses for hay and pasture, and such specialty crops as melons and orchard crops. During years of below-average rainfall or poor rainfall distribution, crops are subject to damage from drought.

Droughtiness is the main limitation to the use and management of these soils. The main concerns of management are maintaining the organic-matter content and fertility and improving tilth. Use of minimum tillage, crop residue, and cover crops helps to conserve moisture and reduce erosion. Crops respond well to additions of lime and fertilizer if moisture is adequate.

CAPABILITY UNIT IIIs-2

This unit consists of deep to moderately deep, well-drained, nearly level soils of the Elston, Fox, and Warsaw series. These soils are on terraces. They generally have a moderately coarse textured surface layer and a medium-textured or moderately fine textured subsoil, except that the Elston soils have a moderately coarse textured and coarse textured subsoil. The Elston and Warsaw soils have a high organic-matter content and moderate natural fertility. The Fox soils have low to moderate organic-matter content and natural fertility. All the soils are moderate to low in available water capacity and have moderate to moderately rapid permeability in the subsoil. The Elston soil is underlain by stratified sand and some gravel. Fox and Warsaw soils are underlain by sand and gravel, and the permeability in these materials is rapid.

The soils in this unit are suited to all crops commonly grown in the county. The main crops are corn, soybeans, grain sorghum, small grain, and meadow and pasture plants. These soils are well suited to irrigated vegetable crops in areas where an adequate water supply is available.

Droughtiness during years of below-average rainfall or poor rainfall distribution is the major limitation to the use and management of these soils. Use of minimum tillage and crop residue and planting early in spring help to overcome damage to crops from drought. Crops respond well to additions of fertilizer and lime if moisture is adequate.

CAPABILITY UNIT IVe-1

This unit consists only of Parke silt loam, 12 to 18 percent slopes, eroded. This is a deep, well-drained, strongly sloping soil on uplands. It has a medium-textured surface layer and a moderately fine textured subsoil. This soil has a low to moderate organic-matter content and natural fertility, and it has a strongly acid surface layer where it is not limed. Available water capacity is high, and permeability is moderate.

This soil is suited to small grain and to meadow and pasture plants. It is also suited to orchard crops. The severe hazard of erosion limits the use of this soil for row crops.

Runoff and the risk of erosion are limitations to the use and management of this soil. The main concerns of management are maintenance and improvement of the organic-matter content and fertility, maintaining good tilth or improving tilth, and controlling erosion. Use of minimum tillage and crop residue helps to improve and maintain the organic-matter content and tilth. These practices and use of contouring, stripcropping, and waterways help to control erosion and runoff. Crops respond well to additions of lime and fertilizer.

CAPABILITY UNIT IVe-3

This unit consists of deep, well-drained, moderately sloping and strongly sloping soils of the Alford and Russell series. These soils are on uplands. They have a medium-textured surface layer and a moderately fine textured subsoil. The moderately sloping soils are severely eroded. All the soils are low to moderate in organic-matter content and natural fertility and have a medium acid surface layer where they are not limed. Available water capacity is high, and permeability is moderate.

These soils are suited to small grain and to meadow and pasture plants. They also are suited to orchard crops. The severe hazard of erosion limits the use of these soils for row crops.

Runoff and the risk of erosion are the major limitations to the use and management of these soils. The main concerns of management are improving and maintaining the organic-matter content and fertility, maintaining good tilth, and controlling erosion. Use of minimum tillage and crop residue helps to maintain a favorable organic-matter content and good tilth. These practices, along with contouring, stripcropping, grassed waterways, and the use of terraces where slopes are less than 12 percent, help to control erosion and runoff. Crops respond well to additions of lime and fertilizer.

CAPABILITY UNIT IVe-7

This unit consists only of Cincinnati silt loam, 6 to 12 percent slopes, severely eroded. This is a deep, well-drained, moderately sloping soil on uplands. It has a medium-textured surface layer and a moderately fine textured subsoil. It has a low organic-matter content and natural fertility and has a strongly acid surface layer where it is not limed. A very slowly permeable fragipan is at a depth of 22 to 32 inches. This pan restricts the downward movement of water and the penetration of roots, and it limits the available water capacity to moderate and permeability to very slow.

This soil is suited to small grain and to meadow and pasture plants. Alfalfa and other deep-rooted crops are not well suited, because the fragipan restricts root penetration and water movement. Crops are subject to damage from drought in years of below-average rainfall or poor rainfall distribution.

Runoff and the risk of erosion are limitations to the use and management of this soil. The main concerns of management are maintaining good tilth and controlling erosion. Use of minimum tillage and crop residue helps to maintain a favorable organic-matter content and good tilth. These practices and the use of terracing, contouring, stripcropping, and waterways help to control runoff and erosion. Crops respond well to additions of lime and fertilizer.

CAPABILITY UNIT IVe-12

This unit consists only of Bloomfield loamy fine sand, 12 to 18 percent slopes. This is a deep, somewhat excessively drained, strongly sloping soil on uplands. It has a coarse-textured surface layer and subsoil. It has a moderate organic-matter content and low natural fertility. The surface layer is medium acid where it is not limed. Available water capacity is low, and permeability is moderately rapid to rapid.

This soil is marginal for crops. Small grain, alfalfa, meadow plants, and orchard crops are grown. During years of below-average rainfall or poor rainfall distribution, crops are subject to severe damage from drought.

The risk of erosion and the low available moisture capacity are limitations to the use and management of this soil. Use of minimum tillage, crop residue, green manure, and cover crops improves and helps to maintain a favorable organic-matter content. Contour cultivation helps to control erosion.

Crops respond well to additions of lime and fertilizer if moisture is adequate.

CAPABILITY UNIT IVe-13

This unit consists only of Fox clay loam, 6 to 12 percent slopes, severely eroded. This is a moderately deep, well-drained, moderately sloping soil on terraces. It has a moderately fine textured surface layer and subsoil. It is underlain by sand and gravel at a depth of 24 to 48 inches. This soil has a low organic-matter content and natural fertility. It has a medium acid or strongly acid surface layer where it is not limed. Available water capacity is low to moderate, and permeability is moderate in the subsoil and rapid in the underlying gravelly material.

This soil is better suited to wheat or other small grain that is seeded in fall or to meadow and pasture plants than to most other crops. Crops are subject to damage from drought during growing seasons that have low rainfall or poor rainfall distribution.

The risk of erosion and the low to moderate available water capacity are limitations to the use and management of this soil. Use of minimum tillage, crop residue, terracing, contour farming, and grassed waterways helps to control runoff and erosion and conserve moisture. Crops respond well to additions of lime and fertilizer if moisture is adequate.

CAPABILITY UNIT IVe-15

This unit consists only of Princeton fine sandy loam, 12 to 18 percent slopes, eroded. This is a deep, well-drained, strongly sloping soil on uplands. It has a moderately coarse textured surface layer and a moderately fine textured subsoil. It has a low to moderate organic-matter content and natural fertility. The surface layer is strongly acid in areas that are not limed. Available water capacity is moderate, and permeability is moderate.

This soil is suited to small grain and to meadow and pasture plants. An occasional row crop can be grown, but the hazard of erosion is severe. During years of below-average rainfall or poor rainfall distribution, crops are subject to damage from drought.

Runoff and erosion are hazards and the moderate available water capacity is a limitation to the use and management of this soil. Use of minimum tillage, terracing, contour farming, and grassed waterways helps to control runoff and erosion and to conserve moisture. Crops respond well to additions of lime and fertilizer if moisture is adequate.

CAPABILITY UNIT VIe-1

This unit consists of deep, well-drained, strongly sloping to very steep soils of the Alford, Cincinnati, Hickory, Negley, and Princeton series. These soils are on uplands. They have a medium-textured or moderately coarse textured surface layer and a moderately fine textured subsoil. The strongly sloping soils are severely eroded. All the soils are low to moderate in organic-matter content and natural fertility, and they have a medium acid to strongly acid surface layer where they are not limed. Available water capacity is moderate to high, and permeability generally is moderate, but the Cincinnati soils have very slow permeability. Cincinnati soils have a very slowly permeable fragipan at a depth of about 2 feet. This pan restricts the downward movement of water and air and the penetration of roots.

The soils in this unit are suited to pasture and meadow plants on the lesser slopes but are better suited to timber on the steeper slopes. Alfalfa and other deep-rooted crops are not well suited to the soils that have a fragipan.

Runoff and the risk of erosion are the major limitations to the use and management of these soils. Crops grown on the Princeton and Cincinnati soils are subject to damage from drought in years of below-average rainfall or poor rainfall distribution. The major concerns of management are improving and maintaining the organic-matter content and fertility and controlling erosion on soils used for meadow and pasture. A permanent vegetative cover helps to check soil losses and runoff. Where tillage is needed to establish meadow or permanent pasture, it should be on the contour to help control erosion. These soils need protection from overgrazing to help keep them from eroding. Meadow and permanent pasture crops respond well to additions of lime and fertilizer.

CAPABILITY UNIT VIIe-1

This unit consists of deep, well-drained, very steep soils of the Hickory and Negley series. These soils are on uplands. They have a medium-textured surface layer and a moderately fine textured subsoil. They have a low to moderate organic-matter content and natural fertility. Available water capacity is high, and permeability is moderate.

Runoff and the risk of erosion are the major limitations to the use and management of these soils. Because of the steepness of slopes and the severe hazard of erosion, these soils are better suited to permanent pasture or woodland than to most other uses. Careful management is needed to prevent overgrazing of pastures.

CAPABILITY UNIT VIIe-2

This unit consists only of Hennepin loam, 25 to 50 percent slopes. This is a deep, well-drained, very steep soil on uplands. It has a medium-textured surface layer. This soil has low to moderate organic-matter content and natural fertility, and the surface layer is slightly acid to neutral where the soil is not limed. The available water capacity and permeability are moderate.

Runoff and the risk of erosion are the major limitations to the use and management of this soil. The soil is too steep for cultivated crops. It is better suited to mixed stands of hardwood trees than to most other uses. The less sloping areas are suited to permanent pasture, but careful management is needed to prevent overgrazing.

CAPABILITY UNIT VIIe-3

This unit consists of Gravel pits, Made land, and Strip mines. Areas of this unit range from very strongly acid to neutral. Gravel pits are on terraces and bottom lands, and Strip mines are on uplands. Runoff and erosion are the main hazards to the use and management of the land types in this unit.

Pits that contain water have a good potential for wildlife habitat development and for recreation. The spoil areas are suited to timber production. In areas that are not very steep or that have been leveled, pasture can be established and maintained. Pasture plants respond well to additions of fertilizer and also to lime in areas that are acid.

CAPABILITY UNIT VIIs-1

This unit consists only of Rodman gravelly loam, 25 to 50 percent slopes. This is an excessively drained soil that is shallow over loose sand and gravel. It lies on terrace breaks and escarpments. The soil has a gravelly, medium-textured surface layer and subsoil, it is high in organic-matter content, and it is neutral to mildly alkaline. It has low available water capacity and very rapid permeability.

The risk of erosion and the low available water capacity are limitations to the use and management of this soil. The soil is better suited to timber than to most other uses. The less sloping areas are suited to permanent pasture if drought-tolerant plants are grown and if grazing is carefully controlled.

Predicted yields

Table 2 shows for each soil the predicted average yields per acre of the principal crops grown under an improved level of management.

The yields shown in table 2 are estimated averages for a period of 5 to 10 years. They are based on farm records, on interviews with farmers and members of the staff of the Purdue Agricultural Experiment Station, and on direct observations by soil scientists and soil conservationists. Considered in making the estimates were the prevailing climate, the characteristics of the soils, and the influence of an improved level of management on the soils.

It should be understood that these yield figures are not intended to apply directly to specific tracts of land for any particular year because the soils vary somewhat from place to place, management practices differ from farm to farm, and weather conditions vary from year to year. Nevertheless, these estimates appear to be as accurate a guide as can be obtained without detailed and lengthy investigation. They are useful in showing the relative productivity of soils under an improved level of management.

The following are assumed to be part of an improved level of management:

1. Using cropping systems that help maintain good tilth and a high organic-matter content.
2. Controlling erosion to the maximum extent feasible, so that the quality of the soil is maintained or improved rather than reduced.
3. Maintaining a high level of fertility by means of frequent soil tests and use of fertilizer in accordance with recommendations of the State Agricultural Experiment Station.
4. Liming the soils in accordance with the results of soil tests.
5. Using crop residue to the fullest extent practicable to protect and improve the soil.
6. Following minimum tillage practices where needed because of the hazards of soil compaction and erosion.
7. Using only the crop varieties that are best suited to the climate and the soil.
8. Controlling weeds carefully by tillage and spraying.
9. Draining wet areas well enough that wetness does not restrict yields of adapted crops.

TABLE 2.—*Predicted average acre yields of the principal crops under an improved level of management*

[Borrow pits (Bp), Gravel pits (Gp), Made land (Ma), and Strip mines (St) are not listed in this table. Dashed lines indicate that the crop is not grown on the soil or is not suited to it]

Soil	Corn	Wheat	Soybeans	Legume-grass (hay)	Pasture
	Bu.	*Bu.*	*Bu.*	*Tons*	*Animal-unit-months*[1]
Ade loamy fine sand, 2 to 6 percent slopes	70	35	25	3.0	5.0
Ade loamy fine sand, 6 to 12 percent slopes	60	30	20	3.0	4.5
Alford silt loam, 2 to 6 percent slopes, eroded	110	50	40	5.0	9.5
Alford silt loam, 6 to 12 percent slopes, eroded	105	45	35	4.5	8.5
Alford silt loam, 6 to 12 percent slopes, severely eroded	90	40	30	4.0	7.5
Alford silt loam, 12 to 18 percent slopes, eroded	90	40	30	4.0	7.5
Alford silt loam, 12 to 18 percent slopes, severely eroded	---	---	---	3.5	7.0
Alford silt loam, 18 to 25 percent slopes, eroded	---	---	---	3.5	7.0
Alford silt loam, 25 to 40 percent slopes	---	---	---	3.0	6.5
Armiesburg silty clay loam	115	45	40	4.5	8.5
Ava silt loam, 2 to 6 percent slopes, eroded	90	40	30	4.0	7.5
Ayrshire fine sandy loam	115	45	45	5.5	10.5
Bartle silt loam	110	40	40	4.5	8.5
Bloomfield loamy fine sand, 2 to 6 percent slopes	65	35	25	2.5	5.0
Bloomfield loamy fine sand, 6 to 12 percent slopes	60	30	20	2.0	4.0
Bloomfield loamy fine sand, 12 to 18 percent slopes	---	---	---	1.5	3.0
Camden silt loam, 0 to 2 percent slopes	120	50	45	5.5	10.5
Camden silt loam, 2 to 6 percent slopes	105	45	40	4.5	8.5
Cincinnati silt loam, 6 to 12 percent slopes, eroded	90	25	25	4.0	7.5
Cincinnati silt loam, 6 to 12 percent slopes, severely eroded	70	25	25	3.5	6.5
Cincinnati silt loam, 12 to 18 percent slopes, severely eroded	---	---	---	3.5	6.5
Cory silt loam	125	50	45	5.5	10.0
Crane silt loam	115	50	35	5.5	10.5
Eel silt loam	115	45	40	4.5	8.5
Elston sandy loam, 0 to 2 percent slopes	90	35	35	3.5	6.5
Elston sandy loam, 2 to 6 percent slopes	85	35	35	3.5	6.5
Fincastle silt loam	115	50	45	5.5	10.5
Fox sandy loam, 0 to 2 percent slopes	80	40	25	3.5	6.5
Fox sandy loam, 2 to 6 percent slopes, eroded	80	35	25	3.5	6.5
Fox clay loam, 6 to 12 percent slopes, severely eroded	70	35	25	3.5	6.5
Genesee silt loam	115	45	40	4.5	8.5
Genesee fine sandy loam, sandy variant	95	45	35	4.0	8.0
Hennepin loam, 25 to 50 percent slopes	---	---	---	---	---
Hickory loam, 18 to 25 percent slopes	---	---	---	3.0	5.5

See footnote at end of table.

TABLE 2.—*Predicted average acre yields of the principal crops under an improved level of management*—Continued

Soil	Corn	Wheat	Soybeans	Legume-grass (hay)	Pasture
	Bu.	*Bu.*	*Bu.*	*Tons*	*Animal-unit-months* [1]
Hickory loam, 25 to 40 percent slopes					
Iva silt loam, 0 to 2 percent slopes	120	50	40	5.0	9.5
Iva silt loam, 2 to 4 percent slopes	115	45	35	4.5	9.5
Millsdale silty clay loam	85	35	35	3.0	5.5
Muren silt loam, 0 to 2 percent slopes	120	50	45	5.0	9.5
Muren silt loam, 2 to 6 percent slopes, eroded	110	50	40	5.0	9.5
Negley loam, 18 to 25 percent slopes				3.0	5.5
Negley loam, 25 to 40 percent slopes					
Parke silt loam, 2 to 6 percent slopes, eroded	100	45	35	4.5	8.5
Parke silt loam, 12 to 18 percent slopes, eroded	85	35	25	4.0	7.5
Petrolia silty clay loam	110	45	40	4.5	8.5
Princeton fine sandy loam, 2 to 6 percent slopes	85	40	30	4.0	7.5
Princeton fine sandy loam, 6 to 12 percent slopes, eroded	75	35	25	4.0	7.5
Princeton fine sandy loam, 12 to 18 percent slopes, eroded		30		4.0	7.5
Princeton fine sandy loam, 18 to 25 percent slopes, eroded				3.0	5.5
Proctor silt loam	120	50	45	5.5	10.5
Ragsdale silt loam	125	50	45	5.5	10.5
Randolph silt loam, 0 to 3 percent slopes	105	40	35	4.0	6.5
Reesville silt loam	125	50	45	5.5	10.5
Rensselaer loam	115	50	45	5.5	10.5
Rensselaer clay loam	125	50	45	5.5	10.5
Rodman gravelly loam, 25 to 50 percent slopes					
Russell silt loam, 2 to 6 percent slopes, eroded	105	45	40	4.5	8.5
Russell silt loam, 6 to 12 percent slopes, eroded	90	40	35	4.5	8.5
Russell silt loam, 6 to 12 percent slopes, severely eroded	85	40	35	3.5	6.5
Russell silt loam, 12 to 18 percent slopes, eroded	75	35	30	3.0	6.5
Shoals silt loam	105	30	40	4.0	7.5
Sloan clay loam	110		45	4.0	7.5
Tippecanoe silt loam	120	50	45	5.5	10.5
Vincennes loam	110	45	40	5.0	9.5
Wakeland silt loam	115	50	40	5.0	9.5
Warsaw sandy loam, 0 to 2 percent slopes	90	45	35	4.5	8.5
Warsaw sandy loam, 2 to 6 percent slopes, eroded	85	35	35	4.0	7.5
Washtenaw silt loam	125	50	45	5.5	10.5
Westland clay loam	125	50	45	5.5	10.5
Whitaker loam	115	50	45	5.5	10.5
Xenia silt loam, 2 to 6 percent slopes, eroded	105	45	40	4.5	8.5
Zipp silty clay	80		35	4.0	7.5

[1] Animal-unit-months is a term used to express the carrying capacity of pasture. It is the number of animals carried per acre multiplied by the number of months the pasture can be grazed during a single grazing season without injury to the sod. For example, an acre of pasture that provides 2 months of grazing for 5 cows has a carrying capacity of 10 animal-unit-months.

Woodland [2]

At one time about 75 percent of Vigo County was covered by high-quality hardwood trees, and the rest was in prairie grasses. A forest survey conducted in 1967 showed that approximately 45,000 acres or about 17 percent of the county remained wooded in that year. Many of the wooded areas are small in size and widely scattered across the county. Most of the present woodland cover should be retained and added to by the well-planned establishment of additional trees.

Wooded areas in the county must be evaluated for their benefits to the community in addition to their value for growing wood crops. These areas have long-term value for the following uses.

Wind protection.—Scattered trees and wooded tracts tend to break up the regular wind pattern and reduce velocity.

Wildlife habitat.—Islands of woody cover are essential for songbirds and all forms of wildlife to exist and reproduce.

Erosion control.—Tree cover is an excellent crop for erosion control and in many places serves as a filter strip for the streams and reservoirs of the county.

Recreation and education.—Wooded areas provide sites for county parks, outdoor laboratories for schools, and nature study areas.

Air pollution control.—Trees are being recognized more each year for their role in reducing air pollution. They release moisture and oxygen into the atmosphere and cool and purify the air.

Environmental improvement.—Wooded tracts add scenic beauty to the county and help to create a better environment.

In table 3 the soils of Vigo County have been placed in five broad groups to give landowners information they need for planning and managing woodland resources. In this table are listed some of the trees and shrubs that grow naturally on the soils of each of the five groups and should be retained when developing an area for more intensive use. It also lists many trees and shrubs suitable for planting for a wide variety of environmental-improvement projects. The group in which a soil has been placed is given in the "Guide to Mapping Units" at the back of this survey.

---

[2] By JOHN O. HOLWAGER, woodland conservationist, Soil Conservation Service.

The table does not list all the plants that grow or that are suitable for planting on the various soils. Assistance on arranging plants, other materials suited to various sites, and sources of plants should be obtained from local landscape architects, commercial nurseries, or forestry specialists.

Wildlife

The soils, topography, climate, wide variety of native and other suited kinds of vegetation, and other features combine to favor development of wildlife habitat in Vigo County (fig. 17).

Three major kinds of wildlife are recognized in Vigo County. These are open-land wildlife, woodland wildlife, and wetland wildlife. There is a high potential for developing habitat for open-land wildlife and woodland wildlife throughout most of the county. Only small, localized areas have a suitable potential for wildlife that prefer a wetland habitat. The three major kinds of wildlife are defined in the following paragraphs.

Open-land wildlife.—This kind consists of birds, mammals, and reptiles that normally frequent cropland, pasture, hayland, and areas that are overgrown with grasses, herbs, and shrubs. Examples of open-land wildlife are rabbit, skunk, quail, and meadowlark. Elements of wildlife habitat used in rating the soils for this kind of wildlife are grain and seed crops, grasses and legumes, wild herbaceous plants, and hardwood woody plants.

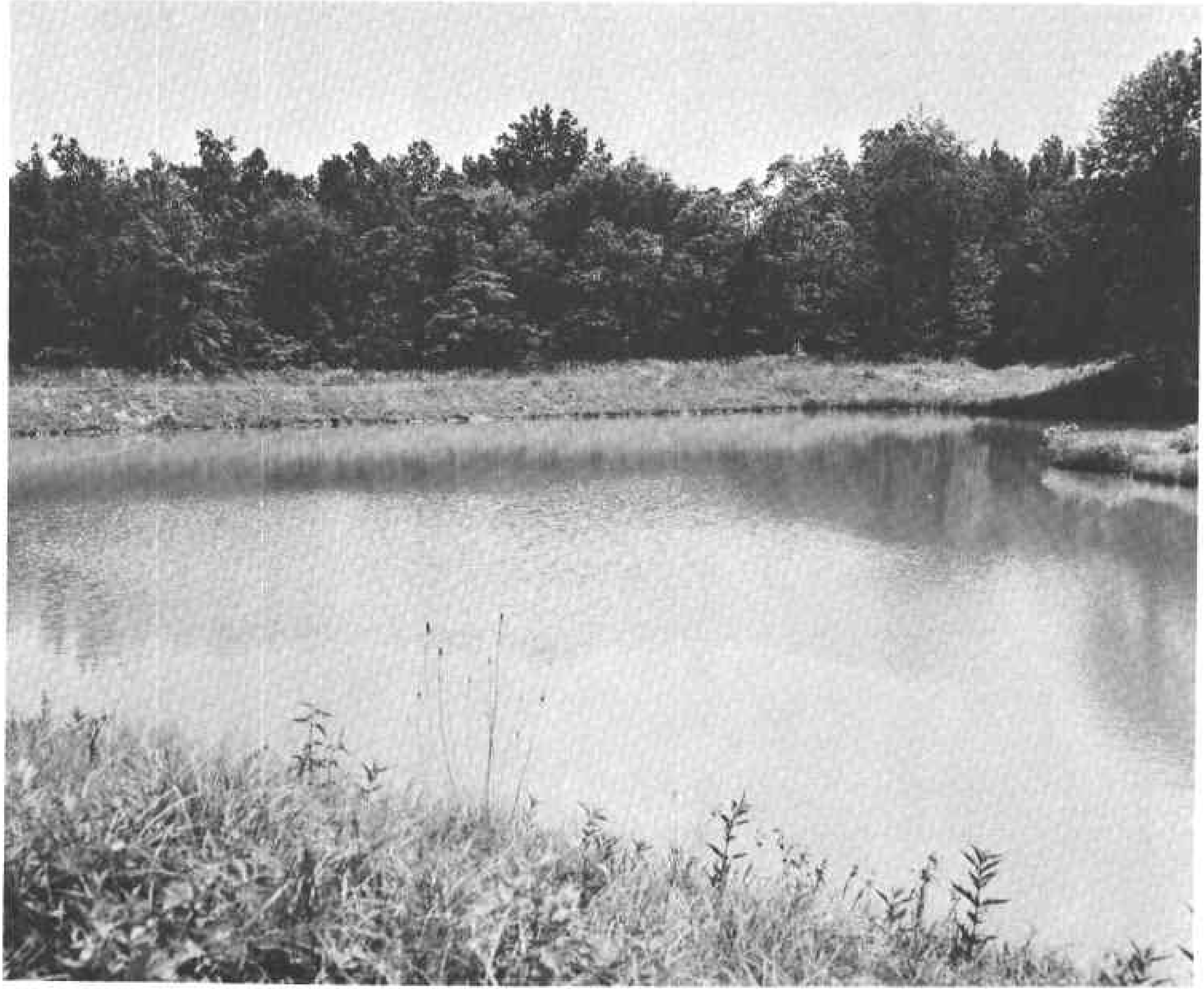


Figure 17.—Wildlife pond constructed on Muren soils. Woods and grass cover around the pond are wildlife habitat.

TABLE 3.—*Tree and shrub guide*

Tree and shrub group, description of the group, and soil symbols	Retain on home and park sites	Plant for woodland crops
I: Somewhat poorly drained to very poorly drained, level, loamy and clayey soils in depressions; seasonal water table at depth of 0 to 3 feet; ponded at times; some soils subject to flooding. Md, Pe, Ra, Rg, Rn, Sh, So, Vn, Wa, Ws, Wt, Zp.	Pin oak, bur oak, shingle oak, sycamore, sweetgum, red river birch.	White pine, sycamore, red maple, white ash, cottonwood.
II: Well-drained to somewhat poorly drained, level to strongly sloping soils; seasonal water table at a depth of 1 to 6 feet. AvB2, Ay, Ba, CnC2, CnC3, CnD3, Co, Cr, Fn, IvA, IvB, RdA, Re, Wx.	Bur oak, pin oak, white oak, scarlet oak, sugar maple, blackgum, tulip-poplar.	White pine, shortleaf pine, tulip-poplar, white ash, sycamore.
III: Well drained and moderately well drained, level to very steep, loamy soils; water table below a depth of 6 feet in the well drained soils and at a depth of 3 to 6 feet in the moderately well drained soils; some soils subject to flooding. AlB2, AlC2, AlC3, AlD2, AlD3, AlE2, AlF, Ar, CaA, CaB, Ee, Ge, Gf, HkE, HkF, MuA, MuB2, NeE, NeF, PaB2, PaD2, PrB, PrC2, PrD2, PrE2, Pt, RuB2, RuC2, RuC3, RuD2, Tp, XeB2.	Red oak, white oak, black walnut, tulip-poplar, sugar maple, sycamore, hackberry.	White pine, red pine, black walnut, tulip-poplar, white ash, black locust.
IV: Somewhat excessively drained and well-drained, nearly level to strongly sloping, sandy and loamy soils; water table below a depth of 6 feet. AdB, AdC, BlB, BlC, BlD, ElA, ElB, FoA, FoB2, FxC3, WrA, WrB2.	Red oak, white oak, shingle oak, scarlet oak, black walnut, blackgum.	White pine, red pine, tulip-poplar, black walnut.
V: Steep escarpments and disturbed areas. Bp, Gp, HeG, Ma, RoG, St.	Sycamore, red river birch, ash, red oak	Areas with pH of 4.0 to 5.5: sycamore, eastern black alder, red river birch, Virginia pine, white pine. Areas with pH of more than 5.5: tulip-poplar, black walnut, sycamore, eastern black alder, cottonwood, white pine, shortleaf pine.

for environmental improvement

Plant for windbreaks, screens, and sound barriers	Plant for beauty and shade	Plant to attract songbirds and wildlife
White pine, Norway spruce, American arborvitae, Lombardy poplar, gray dogwood, silky dogwood, laurel-leaf willow, tall purple willow, medium purple willow.	White pine, white spruce, baldcypress, sycamore, sweetgum, pin oak.	American arborvitae, black spruce, gray dogwood, red-osier dogwood, silky dogwood, elderberry, amur honeysuckle, buttonbush.
White pine, Norway spruce, white spruce, hemlock, autumn-olive, amur honeysuckle, highbush cranberry, blackhaw, serviceberry, rose-of-sharon.	White pine, white spruce, baldcypress, basswood, cornelian cherry, cutleaf sumac.	White spruce, autumn-olive, amur honeysuckle, highbush cranberry, spicebush, blackhaw, mapleleaf, viburnum, serviceberry, cutleaf sumac.
White pine, red pine, Norway spruce, hemlock, autumn-olive.	White pine, red pine, Norway spruce, tulip-poplar, blackgum, honeylocust (thornless), mountain-ash, Norway maple, flowering dogwood, basswood, redbud, white birch.	Hemlock, black locust, mountain-ash, flowering dogwood, basswood, redbud, autumn-olive, amur honeysuckle, blackhaw, serviceberry, hawthorn.
Red pine, Austrian pine, white pine, forsythia, hazelnut, lilac, tamarisk, autumn-olive.	Red pine, white pine, black locust, scarlet oak, blackgum, flowering dogwood.	Black locust, forsythia, hazelnut, privet, Jersey-tea, flowering dogwood.
Red pine, white pine, autumn-olive, blackhaw, hazelnut, forsythia, lilac, staghorn sumac, flowering-quince.	Red pine, white pine, scarlet oak, honeylocust (thornless), Russian-olive.	Virginia pine, Austrian pine, autumn-olive, blackhaw, serviceberry, hazelnut, staghorn sumac, flowering dogwood.

Woodland wildlife.—This kind consists of mammals and birds that frequent areas of hardwood and coniferous trees, shrubs, or a combination of these plants. Examples of woodland wildlife are squirrel, deer, raccoon, woodpecker, and nuthatch. Elements of wildlife habitat used in rating the soils for this kind of wildlife are hardwood woody plants and coniferous woody plants.

Wetland wildlife.—This kind consists of mammals, birds, and reptiles that frequent such wet areas as ponds, marshes, and swamps. Examples of wetland wildlife are muskrat, wild ducks and geese, kingfisher, and redwing blackbird. Elements of wildlife habitat used in rating the soils for this kind of wildlife are wetland food and cover plants, grain and seed crops, shallow water developments, and excavated ponds.

In table 4 the soils in Vigo County are rated according to their suitability for providing habitat for each of the three kinds of wildlife. For a rating other than well suited, the range of suitability of the soil for providing elements of habitat used by the three kinds of wildlife is also given.

A rating of *well suited* means habitats generally are easily created, improved, or maintained. There are few or no limitations that affect management. A rating of *suited* means habitats generally can be created, improved, or maintained, but there are moderate soil limitations. A rating of *poorly suited* means habitats generally can be created, improved, or maintained, but there are rather severe soil limitations. A rating of *unsuited* means it is very questionable that habitat can be created, improved, or maintained and generally it is impractical under prevailing conditions.

TABLE 4.—*Suitability of the soils for three major kinds of wildlife*

Soil series and map symbols	Open-land wildlife	Woodland wildlife	Wetland wildlife
Ade: AdB, AdC	Unsuited: droughty; unsuited to grain and seed crops and to hardwood woody plants; poorly suited to grasses and legumes and wild herbaceous upland plants.	Unsuited: droughty; poorly suited to grasses and legumes and to wild herbaceous upland plants; unsuited to hardwood woody plants and to coniferous woody plants.	Unsuited: droughty; unsuited to grain and seed crops, wetland food and cover plants, shallow water developments, and excavated ponds.
Alford:			
AlB2, AlC2, AlC3	Well suited	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; well suited to grain and seed crops.
AlD2, AlD3	Suited: severe hazard of erosion; suited to grasses and legumes; poorly suited to grain and seed crops; well suited to wild herbaceous upland plants and to hardwood woody plants.	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; poorly suited to grain and seed crops.
AlE2, AlF	Poorly suited: very severe hazard of erosion; unsuited to grain and seed crops; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants.	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, ponds, and grain and seed crops.
Armiesburg: Ar	Well suited	Well suited	Unsuited: well drained; subject to flooding; unsuited to wetland food and cover plants, shallow water developments, and ponds; suited to grain and seed crops.
Ava: AvB2	Well suited	Well suited	Unsuited: moderately well drained; poorly suited to wetland food and cover plants and ponds; unsuited to shallow water developments; well suited to grain and seed crops.
Ayrshire: Ay	Well suited	Suited: somewhat poorly drained; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants.	Suited: somewhat poorly drained; suited to wetland food and cover plants, shallow water developments, ponds, and grain and seed crops.

TABLE 4.—*Suitability of the soils for three major kinds of wildlife*—Continued

Soil series and map symbols	Open-land wildlife	Woodland wildlife	Wetland wildlife
Bartle: Ba	Well suited	Suited: somewhat poorly drained; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants because of rapid growth rate.	Suited: somewhat poorly drained; suited to grain and seed crops, wetland food and cover plants, shallow water developments, and ponds.
Bloomfield: BlB, BlC, BlD	Suited: droughty; poorly suited to grain and seed crops; suited to grasses and legumes, wild herbaceous upland plants, and hardwood woody plants.	Suited: droughty; suited to grasses and legumes, wild herbaceous upland plants, hardwood woody plants, and coniferous woody plants.	Unsuited: droughty; unsuited to grain and seed crops, wetland food and cover plants, shallow water developments, and excavated ponds.
Borrow pits: Bp. Properties too variable for reliable estimates to be made.			
Camden: CaA, CaB	Well suited	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; well suited to grain and seed crops.
Cincinnati:			
CnC2, CnC3	Well suited	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; suited to grain and seed crops.
CnD3	Suited: severe hazard of erosion; poorly suited to grain and seed crops; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants.	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; poorly suited to grain and seed crops.
Cory: Co	Well suited	Suited: somewhat poorly drained; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants.	Suited: somewhat poorly drained; suited to wetland food and cover plants, shallow water developments, ponds, and grain and seed crops.
Crane: Cr	Well suited	Suited: somewhat poorly drained; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants.	Suited: somewhat poorly drained; suited to wetland food and cover plants, shallow water developments, ponds, and grain and seed crops.
Eel: Ee	Well suited	Well suited	Unsuited: moderately well drained; subject to flooding; unsuited to wetland food and cover plants; poorly suited to shallow water developments and ponds; suited to grain and seed crops.
Elston: ElA, ElB	Well suited	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; suited to grain and seed crops.
Fincastle: Fn	Well suited	Suited: somewhat poorly drained; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants.	Suited: somewhat poorly drained; suited to wetland food and cover plants, shallow water developments, ponds, and grain and seed crops.

TABLE 4.—*Suitability of the soils for three major kinds of wildlife*—Continued

Soil series and map symbols	Open-land wildlife	Woodland wildlife	Wetland wildlife
Fox: FoA, FoB2, FxC3	Well suited	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; suited to grain and seed crops.
Genesee: Ge, Gf	Well suited	Well suited	Unsuited: well drained; subject to occasional flooding; unsuited to wetland food and cover plants, shallow water developments, and ponds; suited to grain and seed crops.
Gravel pits: Gp. Properties too variable for reliable estimates to be made.			
Hennepin: HeG	Poorly suited: very severe hazard of erosion; unsuited to grain and seed crops; poorly suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants.	Suited: well drained; poorly suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants.	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; unsuited to grain and seed crops.
Hickory:			
HkE	Suited: severe hazard of erosion; unsuited to grain and seed crops; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants.	Suited: hazard of erosion; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants.	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; unsuited to grain and seed crops.
HkF	Suited: very severe hazard of erosion; unsuited to grain and seed crops; poorly suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants.	Suited: hazard of erosion; poorly suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants.	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, ponds, and grain and seed crops.
Iva:			
IvA	Well suited	Suited: somewhat poorly drained; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants.	Suited: somewhat poorly drained; suited to wetland food and cover plants, shallow water developments, ponds, and grain and seed crops.
IvB	Well suited	Suited: somewhat poorly drained; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants.	Poorly suited: somewhat poorly drained; poorly suited to wetland food and cover plants, shallow water developments, and ponds; suited to grain and seed crops.
Made land: Ma. Properties too variable for reliable estimates to be made.			
Millsdale: Md	Poorly suited: very poorly drained; bedrock at a depth of 20 to 40 inches; unsuited to grain and seed crops; poorly suited to grasses and legumes and to wild herbaceous upland plants; well suited to hardwood woody plants.	Well suited	Suited: bedrock at a depth of 20 to 40 inches; suited to wetland food and cover plants and to shallow water developments; unsuited to ponds.

TABLE 4.—*Suitability of the soils for three major kinds of wildlife*—Continued

Soil series and map symbols	Open-land wildlife	Woodland wildlife	Wetland wildlife
Muren: MuA, MuB2	Well suited	Well suited	Unsuited: moderately well drained; poorly suited or unsuited to wetland food and cover plants, shallow water developments, and ponds; well suited to grain and seed crops.
Negley:			
NeE	Suited: hazard of erosion; unsuited to grain and seed crops; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants.	Suited: well drained; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants.	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, ponds, and grain and seed crops.
NeF	Poorly suited: hazard of erosion; unsuited to grain and seed crops; poorly suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood plants.	Suited: well drained; poorly suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants.	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, ponds, and grain and seed crops.
Parke:			
PaB2	Well suited	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; well suited to grain and seed crops.
PaD2	Suited: hazard of erosion; unsuited to grain and seed crops; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants.	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; well suited to grain and seed crops.
Petrolia: Pe	Poorly suited: poorly drained; unsuited to grain and seed crops; poorly suited to grasses and legumes and to wild herbaceous upland plants; well suited to hardwood woody plants.	Well suited	Suited: subject to flooding; suited to wetland food and cover plants, shallow water developments, and ponds; unsuited to grain and seed crops.
Princeton:			
PrB	Well suited	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and excavated ponds; suited to grain and seed crops.
PrC2, PrD2, PrE2	Suited: hazard of erosion; unsuited to grain and seed crops; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants.	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and excavated ponds; suited to grain and seed crops.
Proctor: Pt	Well suited	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; well suited to grain and seed crops.
Ragsdale: Ra	Poorly suited: very poorly drained; unsuited to grain and seed crops; poorly suited to grasses and legumes and to wild herbaceous upland plants; well suited to hardwood woody plants.	Well suited	Well suited.

TABLE 4.—*Suitability of the soils for three major kinds of wildlife*—Continued

Soil series and map symbols	Open-land wildlife	Woodland wildlife	Wetland wildlife
Randolph: RdA	Well suited	Suited: somewhat poorly drained; bedrock at a depth of 20 to 40 inches; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants.	Suited: somewhat poorly drained; bedrock at a depth of 20 to 40 inches; suited to wetland food and cover plants, shallow water development, and grain and seed crops; unsuited to ponds.
Reesville: Re	Well suited	Suited: somewhat poorly drained; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants (too rapid growth).	Suited: somewhat poorly drained; suited to wetland food and cover plants, shallow water developments, ponds, and grain and seed crops.
Rensselaer: Rg, Rn	Poorly suited: very poorly drained; unsuited to grain and seed crops; poorly suited to grasses and legumes and to wild herbaceous upland plants; well suited to hardwood woody plants.	Well suited	Well suited.
Rodman: RoG	Unsuited: gravel and sand at a depth of 8 to 15 inches; unsuited to grain and seed crops and to grasses and legumes; poorly suited to wild herbaceous upland plants and to hardwood woody plants.	Poorly suited: gravel and sand at a depth of 8 to 15 inches; unsuited to grasses and legumes; poorly suited to wild herbaceous upland plants and to hardwood woody plants; well suited to coniferous woody plants.	Unsuited: excessively drained; sand and gravel at a depth of 8 to 15 inches; unsuited to wetland food and cover plants, shallow water developments, ponds, and grain and seed crops.
Russell:			
RuB2, RuC2, RuC3	Well suited	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; well suited to grain and seed crops.
RuD2	Suited: severe hazard of erosion; suited to grasses and legumes; poorly suited to grain and seed crops; well suited to wild herbaceous upland plants and hardwood woody plants.	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; poorly suited to grain and seed crops.
Shoals: Sh	Well suited	Suited: somewhat poorly drained; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants.	Suited: somewhat poorly drained; subject to flooding; suited to wetland food and cover plants, shallow water developments, and grain and seed crops; poorly suited to ponds.
Sloan: So	Poorly suited: very poorly drained; unsuited to grain and seed crops; poorly suited to grasses and legumes and to wild herbaceous upland plants; well suited to hardwood woody plants.	Well suited	Suited: subject to flooding; suited to wetland food and cover plants, shallow water developments, ponds, and grain and seed crops.
Strip mines: St. Properties too variable for reliable estimates to be made.			

TABLE 4.—*Suitability of the soils for three major kinds of wildlife*—Continued

Soil series and map symbols	Open-land wildlife	Woodland wildlife	Wetland wildlife
Tippecanoe: Tp	Well suited	Well suited	Poorly suited to unsuited: moderately well drained; poorly suited to wetland food and cover plants; unsuited to shallow water developments and ponds; well suited to grain and seed crops.
Vincennes: Vn	Poorly suited: poorly drained; unsuited to grain and seed crops; poorly suited to grasses and legumes and to wild herbaceous upland plants; well suited to hardwood woody plants.	Well suited	Well suited.
Wakeland: Wa	Well suited	Suited: somewhat poorly drained; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants (too rapid growth).	Suited: somewhat poorly drained; subject to flooding; suited to wetland food and cover plants, shallow water developments, and grain and seed crops; poorly suited to ponds.
Warsaw: WrA, WrB2	Well suited	Well suited	Unsuited: well drained; unsuited to wetland food and cover plants, shallow water developments, and ponds; suited to grain and seed crops.
Washtenaw: Ws	Poorly suited: very poorly drained; unsuited to grain and seed crops; poorly suited to grasses and legumes and to wild herbaceous upland plants; well suited to hardwood woody plants.	Well suited	Well suited.
Westland: Wt	Poorly suited: very poorly drained; unsuited to grain and seed crops; poorly suited to grasses and legumes and to wild herbaceous upland plants; well suited to hardwood woody plants.	Well suited	Well suited.
Whitaker: Wx	Well suited	Suited: somewhat poorly drained; suited to grasses and legumes; well suited to wild herbaceous upland plants and to hardwood woody plants; poorly suited to coniferous woody plants.	Suited: somewhat poorly drained; suited to wetland food and cover plants, shallow water developments, ponds, and grain and seed crops.
Xenia: XeB2	Well suited	Well suited	Unsuited: moderately well drained; unsuited to wetland food and cover plants and shallow water developments; poorly suited to ponds; well suited to grain and seed crops.
Zipp: Zp	Poorly suited: very poorly drained; unsuited to grain and seed crops; poorly suited to grasses and legumes and to wild herbaceous upland plants; well suited to hardwood woody plants.	Well suited	Suited: subject to flooding; suited to wetland food and cover plants, shallow water developments, and ponds; unsuited to grain and seed crops.

Use of the Soils for Recreation

The landscape and resources of Vigo County and its location relative to populated areas make it feasible to develop some income-producing recreational enterprises. The most likely enterprises are hunting areas, shooting preserves, improved picnic areas, camping areas, golf courses, fishing waters, and water sports.

Many recreational facilities have been established and are in use today. These include Fowler Park, Green Valley State Fish and Game Area, Deming Park, and Rea Park Golf Course.

Watershed development in upland areas offers potential for multipurpose impoundments of water in bodies of different size. Some well-drained soils in upland areas are well suited to picnic grounds, intensive play areas, and tent and camp trailer sites.

In table 5 the soils in Vigo County are rated according to their limitations for developing the six kinds of recreational facilities described in the following paragraphs.

Cottages and utility buildings.—These structures are seasonal or year-round cottages, washrooms and bathrooms, picnic shelters, and service buildings. Factors considered are wetness and hazard of flooding, slope, rockiness and stoniness, and depth to hard bedrock. Additional factors that must be considered are suitability for septic tank filter fields, shrink-swell potential and frost action, hillside slippage, presence of loose sand, and bearing capacity. Suitability of the soil for supporting vegetation and whether basements and underground utilities are planned should be considered in the final evaluation.

Tent and camp trailer sites.—These are areas that are suitable for tent and camp trailer sites and the accompanying activities of outdoor living. They are used frequently during the camping season. They should require little site preparation and should be suitable for unsurfaced parking areas for cars and camp trailers, for heavy foot traffic by humans and horses, and for vehicles. Factors considered are wetness, hazard of flooding, permeability, slope, texture of the surface layer, coarse fragments, and stoniness or rockiness. Suitability of the soils for supporting vegetation should also be considered.

Picnic areas, parks, and extensive play areas.—These are areas that are suitable for heavy foot traffic and are used by people for the consumption of food in a natural outdoor environment. Ratings are based on wetness, hazard of flooding, slope, texture of the surface layer, and stoniness or rockiness. Ratings do not include such features as the presence of trees or ponds that may affect the desirability of a site. Suitability of the soils for supporting vegetation should also be considered.

Playgrounds, athletic fields, and intensive play areas.—These areas are developed for playgrounds and such organized games as baseball, football, tennis, and badminton. They are subject to heavy foot traffic and generally require a level surface, good drainage, and a soil texture and consistence that give a firm surface. It is assumed that good vegetative cover can be established and maintained where needed.

Bridle paths and nature and hiking trails.—These are are used for trails, cross-country hiking, bridle paths, and other intensive uses that allow for the movement of people. It is assumed that these areas are to be used as they occur in nature and that little soil will be moved in providing this recreational use. From a physical standpoint, the most desirable soils for bridle paths and for nature and hiking trails are those that have good foot-and-hoof trafficability. They are well drained, loamy, and nearly level to sloping. They have good stability, are not subject to erosion or cutting out, and are free of coarse fragments and stones or rock outcrops. Where the soils are sloping, consideration should be given to placement of paths and trails on the contour to help control erosion. Variability in slope on paths and trails may serve to enhance interest, but slopes should not exceed 12 percent for great distances.

Golf course fairways.—In evaluating soils for use as golf courses, consideration was given only to those features of the soils that influence their use for fairways. Greens, traps, and hazards are manmade, generally from disturbed, transported soil material. Fairways should be well drained and firm, be free of flooding during periods of use, have good trafficability, contain a minimum of coarse fragments or stones, and have gently undulating slopes. They should be capable of supporting a good turf and be well suited to many kinds of trees and shrubs. Loamy soils are better than other soils for fairways, but coarser textured soils serve equally well if they are irrigated. Poorly drained mineral soils have severe limitations, but they can be used for pond sites to provide esthetic value or for storing water for turf maintenance. Sandy soils can be designed for hazards or used as a source of sand for greens.

The ratings used in table 5 are slight, moderate, and severe. For a rating other than slight, the degree of limitations of the soil for developing a specific recreational facilitiy is also given. A rating of *slight* means the facility is easily created, improved, or maintained. There are few or no limitations that affect design or management. A *moderate* limitation means that the facility generally can be created, improved, or maintained, but that there are moderate soil limitations that affect design or management. A rating of *severe* means that the practicability of establishing the facility is questionable. Extreme measures are needed to overcome the limitation and usage generally is not practical.

Engineering Uses of the Soils[3]

This section lists and describes the properties of soils that are important for engineering uses. Of special interest to engineers are soil properties that affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, and drainage systems. Among the soil properties most important in engineering are permeability, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and pH. Depth to the water table and to bedrock also is important. Soil development related to topographic position also may be significant.

---

[3] HAROLD W. BELCHER, SR., area engineer, and ROBERT E. DUNN, agricultural engineer, Soil Conservation Service, assisted in preparing this section.

TABLE 5.—*Ratings and limitations of soils for recreational uses*

Soil series and map symbols	Cottages and utility buildings	Tent and camp trailer sites	Picnic areas, parks, and extensive play areas	Playgrounds, athletic fields, and intensive play areas	Bridle paths and nature and hiking trails	Golf course fairways
Ade:						
AdB	Slight	Moderate: sandy material subject to blowing; impaired trafficability; droughty.	Moderate: sandy material subject to blowing; impaired trafficability; droughty.	Moderate: 2 to 6 percent slopes; sandy material subject to blowing; impaired trafficability.	Moderate: sandy material subject to blowing; impaired trafficability.	Moderate: sandy material subject to blowing; droughty.
AdC	Moderate: 6 to 12 percent slopes.	Moderate: sandy material subject to blowing; impaired trafficability; droughty.	Moderate: sandy material subject to blowing; impaired trafficability; droughty.	Severe: 6 to 12 percent slopes.	Moderate: sandy material subject to blowing; impaired trafficability.	Severe: sandy material subject to blowing; droughty.
Alford:						
AlB2	Slight	Slight	Slight	Moderate: 2 to 6 percent slopes.	Slight	Slight.
AlC2	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Severe: 6 to 12 percent slopes.	Slight	Moderate: 6 to 12 percent slopes.
AlC3	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Severe: 6 to 12 percent slopes.	Slight	Severe: severely eroded.
AlD2, AlD3, AlE2.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Moderate: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.
AlF	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.
Armiesburg: Ar	Severe: subject to flooding.	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]	Moderate: subject to flooding.[1]
Ava: AvB2	Slight	Moderate: 2 to 6 percent slopes.	Slight	Moderate: 2 to 6 percent slopes; very slowly permeable.	Slight	Slight.
Ayrshire: Ay	Moderate: seasonal high water table.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Bartle: Ba	Moderate: seasonal high water table.	Severe: somewhat poorly drained; very slow permeability.	Moderate: somewhat poorly drained.	Severe: somewhat poorly drained; very slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Bloomfield:						
BlB	Slight	Moderate: sandy material subject to blowing; impaired trafficability; droughty.	Moderate: sandy material subject to blowing; impaired trafficability; droughty.	Moderate: 2 to 6 percent slopes; sandy material subject to blowing; impaired trafficability.	Moderate: sandy material subject to blowing; impaired trafficability.	Moderate: sandy material subject to blowing; droughty.
BlC	Moderate: 6 to 12 percent slopes.	Moderate: sandy material subject to blowing; impaired trafficability; droughty.	Moderate: sandy material subject to blowing; impaired trafficability; droughty.	Severe: 6 to 12 percent slopes.	Moderate: sandy material subject to blowing; impaired trafficability.	Moderate: sandy material subject to blowing; droughty.

See footnote at end of table.

TABLE 5.—*Ratings and limitations of soils for recreational uses*—Continued

Soil series and map symbols	Cottages and utility buildings	Tent and camp trailer sites	Picnic areas, parks, and extensive play areas	Playgrounds, athletic fields, and intensive play areas	Bridle paths and nature and hiking trails	Golf course fairways
Bloomfield—Continued						
BlD	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Moderate: sandy material subject to blowing; impaired trafficability.	Severe: 12 to 18 percent slopes; sandy material subject to blowing; droughty.
Borrow pits:						
Bp. Properties too variable to be estimated.						
Camden:						
CaA	Slight	Slight	Slight	Slight	Slight	Slight.
CaB	Slight	Slight	Slight	Moderate: 2 to 6 percent slopes.	Slight	Slight.
Cincinnati:						
CnC2	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Severe: 6 to 12 percent slopes.	Slight	Moderate: 6 to 12 percent slopes.
CnC3	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Severe: 6 to 12 percent slopes.	Slight	Severe: severely eroded.
CnD3	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Moderate: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.
Cory: Co	Moderate: seasonal high water table.	Moderate: somewhat poorly drained; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Crane: Cr	Moderate: seasonal high water table.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; moderate permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Eel: Ee	Severe: subject to flooding.	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]	Moderate: subject to flooding.[1]
Elston:						
ElA	Slight	Slight	Slight	Slight	Slight	Slight.
ElB	Slight	Slight	Slight	Moderate: 2 to 6 percent slopes.	Slight	Slight.
Fincastle: Fn	Moderate: seasonal water table.	Moderate: somewhat poorly drained; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Fox:						
FoA	Slight	Slight	Slight	Slight	Slight	Slight.
FoB2	Slight	Slight	Slight	Moderate: 2 to 6 percent slopes.	Slight	Slight.
FxC3	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Severe: 6 to 12 percent slopes.	Slight	Severe: severely eroded.

See footnote at end of table.

TABLE 5.—*Ratings and limitations of soils for recreational uses*—Continued

Soil series and map symbols	Cottages and utility buildings	Tent and camp trailer sites	Picnic areas, parks, and extensive play areas	Playgrounds, athletic fields, and intensive play areas	Bridle paths and nature and hiking trails	Golf course fairways
Genesse: Ge, Gf	Severe: subject to flooding.[1]	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]	Moderate: subject to flooding.[1]
Gravel pits: Gp. Properties too variable to be estimated.						
Hennepin: HeG	Severe: 25 to 50 percent slopes.	Severe: 25 to 50 percent slopes.	Severe: 25 to 50 percent slopes.	Severe: 25 to 50 percent slopes.	Severe: 25 to 50 percent slopes.	Severe: 25 to 50 percent slopes.
Hickory:						
HkE	Severe: 18 to 25 percent slopes.	Severe: 18 to 25 percent slopes.	Severe: 18 to 25 percent slopes.	Severe: 18 to 25 percent slopes.	Moderate: 18 to 25 percent slopes.	Severe: 18 to 25 percent slopes.
HkF	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.
Iva: IvA, IvB	Moderate: seasonal high water table.	Moderate: somewhat poorly drained; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Made land: Ma. Properties too variable to be estimated.						
Millsdale: Md	Severe: very poorly drained; high water table; subject to ponding; bedrock at a depth of 20 to 40 inches.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding; bedrock at a depth of 20 to 40 inches.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.
Muren:						
MuA	Slight	Slight	Slight	Slight	Slight	Slight.
MuB2	Slight	Slight	Slight	Moderate: 2 to 6 percent slopes; moderately slow permeability.	Slight	Slight.
Negley:						
NeE	Severe: 18 to 25 percent slopes.	Severe: 18 to 25 percent slopes.	Severe: 18 to 25 percent slopes.	Severe: 18 to 25 percent slopes.	Moderate: 18 to 25 percent slopes.	Severe: 18 to 25 percent slopes.
NeF	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.	Severe: 25 to 40 percent slopes.
Parke:						
PaB2	Slight	Slight	Slight	Moderate: 2 to 6 percent slopes.	Slight	Slight.
PaD2	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Moderate: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.

See footnote at end of table.

TABLE 5.—*Ratings and limitations of soils for recreational uses*—Continued

Soil series and map symbols	Cottages and utility buildings	Tent and camp trailer sites	Picnic areas, parks, and extensive play areas	Playgrounds, athletic fields, and intensive play areas	Bridle paths and nature and hiking trails	Golf course fairways
Petrolia: Pe	Severe: subject to flooding; poorly drained.	Severe: poorly drained; subject to flooding.[1]	Severe: poorly drained; subject to flooding.[1]	Severe: poorly drained; subject to flooding.[1]	Severe: poorly drained; subject to flooding.[1]	Severe: poorly drained; subject to flooding.[1]
Princeton:						
PrB	Slight	Slight	Slight	Moderate: 2 to 6 percent slopes.	Slight	Slight.
PrC2	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Severe: 6 to 12 percent slopes.	Slight	Moderate: 6 to 12 percent slopes.
PrD2, PrE2.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.	Moderate: 12 to 25 percent slopes.	Severe: 12 to 25 percent slopes.
Proctor: Pt	Slight	Slight	Slight	Slight	Slight	Slight.
Ragsdale: Ra	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; subject to ponding; high water table.	Severe: very poorly drained; subject to ponding; high water table.	Severe: very poorly drained; high water table; subject to ponding.
Randolph: RdA	Severe: bedrock at a depth of 20 to 40 inches; seasonal high water table.	Moderate: somewhat poorly drained; bedrock at a depth of 20 to 40 inches; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; bedrock at a depth of 20 to 40 inches; slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Reesville: Re	Moderate: seasonal high water table.	Moderate: somewhat poorly drained; slow permeability; slow to dry after rains.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slow permeability; slow to dry after rains.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Rensselaer: Rg, Rn.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.
Rodman: RoG	Severe: 25 to 50 percent slopes.	Severe: 25 to 50 percent slopes.	Severe: 25 to 50 percent slopes.	Severe: 25 to 50 percent slopes.	Severe: 25 to 50 percent slopes.	Severe: 25 to 50 percent slopes.
Russell:						
RuB2	Slight	Slight	Slight	Moderate: 2 to 6 percent slopes.	Slight	Slight.
RuC2	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Severe: 6 to 12 percent slopes.	Slight	Moderate: 6 to 12 percent slopes.
RuC3	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Moderate: 6 to 12 percent slopes.	Severe: 6 to 12 percent slopes.	Slight	Severe: severely eroded.
RuD2	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.	Moderate: 12 to 18 percent slopes.	Severe: 12 to 18 percent slopes.
Shoals: Sh	Severe: subject to flooding.	Severe: subject to flooding.[1]	Severe: subject to flooding.[1]	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]	Severe: subject to flooding.[1]

See footnote at end of table.

TABLE 5.—*Ratings and limitations of soils for recreational uses*—Continued

Soil series and map symbols	Cottages and utility buildings	Tent and camp trailer sites	Picnic areas, parks, and extensive play areas	Playgrounds, athletic fields, and intensive play areas	Bridle paths and nature and hiking trails	Golf course fairways
Sloan: So	Severe: subject to flooding; very poorly drained; high water table.	Severe: very poorly drained; high water table; subject to flooding.[1]	Severe: very poorly drained; high water table; subject to flooding.[1]	Severe: very poorly drained; high water table; subject to flooding.[1]	Severe: very poorly drained; high water table; subject to flooding.[1]	Severe: very poorly drained; high water table; subject to flooding.[1]
Strip mines: St. Properties too variable to be estimated.						
Tippecanoe: Tp.	Slight	Slight	Slight	Slight	Slight	Slight.
Vincennes: Vn	Severe: poorly drained; high water table; subject to ponding.	Severe: poorly drained; high water table; subject to ponding.	Severe: poorly drained; high water table; subject to ponding.	Severe: poorly drained; high water table; subject to ponding.	Severe: poorly drained; high water table; subject to ponding.	Severe: poorly drained; high water table; subject to ponding.
Wakeland: Wa	Severe: subject to flooding.	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]	Moderate: subject to flooding.[1]
Warsaw:						
WrA	Slight	Slight	Slight	Slight	Slight	Slight.
WrB2	Slight	Slight	Slight	Moderate: 2 to 6 percent slopes.	Slight	Slight.
Washtenaw: Ws	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.
Westland: Wt	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.	Severe: very poorly drained; high water table; subject to ponding.
Whitaker: Wx	Moderate: seasonal high water table.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.
Xenia: XeB2	Slight	Slight	Slight	Moderate: 2 to 6 percent slopes.	Slight	Slight.
Zipp: Zp	Severe: very poorly drained; high water table; subject to ponding or flooding.	Severe: very poorly drained; subject to ponding or flooding; very slow permeability.[1]	Severe: very poorly drained; subject to ponding or flooding.[1]	Severe: very poorly drained; subject to ponding or flooding; very slow permeability.[1]	Severe: high water table; very poorly drained; subject to ponding or flooding.[1]	Severe: high water table; very poorly drained; subject to ponding or flooding.[1]

---

[1] Frequency and intensity of flooding are extremely variable; onsite inspection required.

The information in this survey can be used to—

1. Make studies of soil and land use that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway and airport locations and in planning detailed soil surveys of the selected locations.
3. Assist in designing drainage systems, ponds, diversion terraces, and other structures for soil and water conservation.
4. Locate possible sources of sand and gravel.
5. Correlate performance of structures with soil mapping units and, thus, develop information that can be useful in designing and maintaining new structures.
6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs for the purpose of making maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

The information in this survey will not eliminate the need for sampling and testing soils on the site to determine their suitability for specific engineering purposes, but the interpretations can be used to select sites that may be suitable and to plan detailed field investigations.

The data in table 6 are from laboratory tests. The estimates for the soils listed in tables 7 and 8 were made by comparing those soils with the soils tested. At many construction sites, major variations in soil characteristics may be present within the depth of the proposed excavations and several soils may be present within a short distance. For this reason, laboratory data on engineering properties of the soils should be determined for the soil at the site before any engineering work is planned in detail.

Some of the terms used by the soil scientist may be unfamiliar to the engineer, and some words, for example, soil, clay, silt, sand, aggregate, granular, surface soil, subsoil, and horizon, have special meanings in soil science. Most of these terms, as well as other special terms that are used in the soil survey, are defined in the Glossary at the back of this survey.

Information useful for engineering can be obtained from the soil map. It will often be necessary, however, to refer to other parts of the survey. By using the information in the soil map, the soil profile descriptions, and the tables in this section, the engineer can plan a detailed survey of the soil at the construction site.

Engineering classification systems

Two systems for classifying soils are in general use among engineers. Most highway engineers classify soil material according to the system used by the American Association of State Highway Officials (AASHO) (*1*). Other engineers prefer to use the Unified soil classification system (*7*). Both classification systems are used in this survey in table 6 and 7 and are briefly described here.

AASHO classification system.—Highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials. In this system all soil materials are classified in seven principal groups, based on mechanical analysis and plasticity test data. The groups ranges from A-1 (gravelly soils of high bearing capacity, the best soil for subgrades) to A-7 (clay soils having low strength when wet, the poorest soils for subgrades.) Highly organic soils such as peat and muck are not included in this classification, because their use as construction material or foundation material should be avoided.

Unified classification.—This classification is based on the identification of soils according to their texture, plasticity, and liquid limit. The three major groupings are coarse-textured soils, fine-textured soils, and organic soils. The soils are divided into 15 classes: eight classes for coarse-grained material (GW, GP, GM, GC, SW, SP, SM, SC), six classes for fine-grained material (ML, CL, OL, MH, CH, OH), and one class for highly organic material (Pt.)

Engineering test data

Table 6 presents test data for samples from five soil series in the county. These samples were tested by standard procedures in the laboratories of the Joint Highway Research Project at Purdue University. The samples do not represent all the soils in Vigo County, nor do they include the entire range of characteristics of any series sampled. Not all layers of each profile were sampled. The test results, however, have been used as a general guide in estimating the engineering properties of the soils in the county. Tests were made for moisture-density relationships, liquid limit, and plastic limit. Texture was determined by mechanical analysis.

Moisture-density relationships indicate the moisture content at which soil material can be compacted to a maximum dry density. If a soil is compacted at a successively higher moisture content, assuming that the compactive effort remains the same, the density of the compacted material increases until the optimum moisture content is reached. After that, the density decreases with increase in moisture content. The ovendry weight, in pounds per cubic foot, of soil material that was compacted at optimum moisture content is termed the maximum dry density for that compactive effort. Data on the relationship of moisture to density is important in planning earthwork, for generally a soil is most stable if compacted to about its maximum dry density when it is at approximately the optimum moisture content for standard compactive effort.

Mechanical analysis to determine the particle-size distribution of the soil material was made by a combination of the sieve and hydrometer methods. The names of the various particle sizes—sand, silt, and clay—do not mean the same when used by engineers as when they are used by soil scientists. For example, to soil scientists "clay" means mineral grains less than 0.002 millimeter in diameter, but to engineers it may mean all particles less than 0.005 millimeter in diameter.

The tests for liquid limit and plastic limit indicate the effect of water on the consistence of soil material. The liquid limit is the moisture content at which the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content through which a soil material is plastic.

Estimated engineering properties

In table 7 the soil series of the county and the symbols for mapping units are listed, and certain properties that are significant to engineering are described. Some of the estimates are based on available test data. Estimates of properties of soils not tested and based on test data for similar soils in this county and other counties and on experience gained from working with and observing similar soils in other areas. These estimates provide information that can be used by the engineer. They are not, however, a substitute for detailed testing that may be needed at a site selected for construction. In general, the information in this table applies to a depth of 5 feet or less.

Depth to seasonal high water table is the depth to a layer of soil that is saturated because of slow permeability in the underlying layers of the soil. This seasonal, or perched, water table may be separated from a lower table by a dry zone.

Depth from surface of representative profile normally is given only for the major horizons listed, but other horizons also are listed if they have engineering properties, significantly different from the adjacent horizons.

Dominant USDA texture is based on the relative amounts of sand, silt, and clay in a soil, giving rise to textural class names such as sand, sandy loam, and clay.

Unified classification of soil materials is according to the Unified soil classification system.

AASHO classification of soil materials is according to the American Association of State Highway Officials Designation M 145-49 (*1*).

Percentage passing sieves No. 10, 40, and 200 are estimates and are rounded off to the nearest 5 percent. If there is little gravel-size material present, the percentage of material passing the No. 200 sieve approximates the amount of silt and clay in a soil.

Permeability refers to movement of water downward through undisturbed soil material. Estimates are based largely on texture, structure, and consistency.

Available water capacity refers to the capacity of soils to store water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Reaction lists estimated ranges in field pH values for each major horizon.

Frost action includes heave caused by ice lenses forming in a soil and the subsequent loss of strength as a result of excess moisture during thawing periods. Three conditions must exist for frost action to become a major consideration: (1) a susceptible soil; (2) a source of water during the freezing period; and (3) a suitable temperature gradient that exists long enough for a freezing temperature to penetrate the ground.

Shrink-swell potential indicates the volume change to be expected with a change in moisture content. The estimates are based primarily on the amount and kind of clay in a soil.

Engineering interpretations

Table 8 rates the soils according to their suitability as a source of topsoil, sand and gravel, and road fill. It also lists soil features that affect use of the soils as sites for highway locations; pond reservoirs; dams, dikes, levees and embankments; grassed waterways; agricultural drainage; and terraces and diversions. The interpretations in this table apply to the representative profile of each series described in the section "Descriptions of the Soils".

Some features of a soil may be helpful in one kind of engineering work and a hindrance in another. For example, a highly permeable substratum is a feature that would make a soil undesirable as a site for a farm pond, but it might be favorable as a location for a highway.

Topsoil.—Topsoil refers to soil material, preferably high in organic-matter content, that is used to topdress back slopes, embankments, lawns, gardens, and other areas. The suitability rating is based mainly on texture and organic-matter content.

Sand and gravel.—The suitability rating applies to the soil material within a depth of 5 to 7 feet. Sand or sand and gravel occur at variable depths within soils of the same series. Test pits are needed to determine the extent and availability of sand or sand and gravel.

Road fill.—The suitability ratings are based on the performance of soil material when used as borrow for subgrade. Both the subsoil and the underlying material are rated if they are contrasting in character.

Highway locations.—Soil features considered are those that affect overall performance of the soil. The entire profile was evaluated, based on an undisturbed soil without artificial drainage.

Pond reservoir areas.—The primary concerns are features of the undisturbed soil that affect the seepage rate.

Dams, dikes, levees, and embankments.—The features considered are those that affect the use of disturbed soil material for constructing embankments to impound surface water.

Grassed waterways.—Features that affect the establishment, growth, and maintenance of vegetation and layout and construction are considered.

Agricultural drainage.—Features are considered that affect the installation and performance of surface and subsurface drainage systems. These features are soil texture, permeability, topography, seasonal water table, and restricting layers.

Terraces and diversions.—Features that affect layout and construction are considered. Among these features are topography, texture, and depth to soil material that is unfavorable to crop production.

TABLE 6.—*Engineering*

[Tests performed by Soils and Pavement Design Laboratory, Joint Highway Research Project, School of Civil Engineering, Purdue Univer-

Soil name and location	Parent material	SCS Report No. S70 Ind–84	Depth	Moisture density [1]		Mechanical analysis [2]		
				Maximum dry density	Optimum moisture	Percentage passing sieve—		
						1-in.	¾-in.	⅜-in.
			Inches	*Pct.*	*Pct.*			
Ayrshire fine sandy loam: SW¼ sec. 12, T. 13 N., R. 8 W. (Modal)	Eolian fine sand and silt on loess plain.	7–1	0–10	120	13	100	100	100
		7–2	18–38	109	17	100	100	100
		7–3	64–74	117	14	100	100	100
Elston sandy loam: NE¼ sec. 14, T. 13 N., R. 9 W. (Modal)	Glacial outwash on Wisconsin terrace.	6–1	0–10	115	14	100	100	100
		6–3	20–34	115	15	100	100	100
		6–5	45–60	100	22	100	100	100
Fincastle silt loam: SE¼ sec. 11, T. 13 N., R. 10 W. (Modal)	Loess over glacial till on Wisconsin-age ground moraine.	5–3	12–30	99	22	100	100	100
		5–6	55–66	124	11	100	100	99
Hickory loam: SW¼ sec. 26, T. 12 N., R. 10 W. (Modal)	Glacial till of Illinoian age on ground moraine.	3–2	1–11	114	15	100	100	100
		3–5	28–44	121	12	100	100	100
		3–7	48–58	123	12	100	99	98
Princeton fine sandy loam: NW¼ sec. 5, T. 10 N., R. 9 W. (Modal)	Eolian fine sand and silt on loess plain.	2–1	0–8	122	12	100	100	100
		2–3	11–26	112	16	100	100	100
		2–6	60–88	117	14	100	100	100

---

[1] Based on AASHO Designation T 99-57, Method A (*1*).

[2] Mechanical analyses according to the AASHO Designation T 88. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analysed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

test data

sity, West Lafayette, Indiana, in accordance with standard test methods of the American Association of State Highway Officials (AASHO)]

Mechanical analysis [3]—Continued								Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued				Percentage smaller than—						AASHO [4]	Unified [5]
No.4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	[3] 0.002 mm.				
100	100	98	52	49	38	21	15	--------	(6)	A-4(3)	ML
100	99	96	61	58	58	35	29	25	8	A-4(5)	CL
100	100	99	20	19	18	16	15	--------	(6)	A-2-4(0)	SM
100	100	41	25	25	24	17	14	21	4	A-2-4(0)	SM-SC
97	90	35	20	19	18	16	13	27	8	A-2-4(0)	SC
99	98	45	13	12	10	9	9	--------	(6)	A-1-b(0)	SM-SW
100	100	99	96	93	79	46	36	48	22	A-7-6(14)	CL
97	90	75	57	48	38	24	17	21	5	A-4(3)	ML-CL
98	98	91	68	65	49	21	15	19	(6)	A-4(7)	CL
98	96	84	45	44	43	35	30	28	12	A-6(3)	SC
95	92	77	47	45	38	26	20	19	5	A-4(2)	SM-SC
100	100	96	36	33	25	14	10	--------	(6)	A-4(0)	SM
100	100	96	59	58	53	36	31	35	17	A-6(8)	CL
100	100	93	18	16	15	15	14	--------	(6)	A-2-4(0)	SM

---

[3] Percentage of clay was determined by hydrometer method and varies several percentage points from field determinations.

[4] Based on AASHO Designation M 145-49 (*1*).

[5] Based on the Unified soil classification system (*7*).

[6] NP= Nonplastic.

TABLE 7.—*Estimated soil properties*

[The symbol > means more than;

Soil series and map symbols	Depth to seasonal high water table	Depth from surface (representative profile)	Classification		
			Dominant USDA texture	Unified	AASHO
	Feet	*Inches*			
Ade: AdB, AdC	>6	0–11	Loamy fine sand	SM	A–2
		11–32	Fine sand	SP or SM	A–2 or A–3
		32–102	Fine sand containing thin bands of sandy loam.	SP–SM or SM	A–2 or A–3
Alford: AlB2, AlC2, AlC3, AlD2, AlD3, AlE2, AlF.	>6	0–8	Silt loam	ML	A–4
		8–45	Silty clay loam	CL	A–6
		45–78	Silt loam	CL or ML	A–6 or A–4
Armiesburg: Ar	>6	0–20	Silty clay loam	CL or CH	A–6 or A–7
		20–41	Silty clay loam	CL or CH	A–6 or A–7
		41–72	Stratified silty clay loam, silt loam, and very fine sand.	CL, CH, or ML	A–6, A–7, or A–4
Ava: AvB2	3–6	0–6	Silt loam	ML or CL	A–4 or A–6
		6–29	Light silty clay loam	CL	A–6
		29–58	Light silty clay loam (fragipan)	CL	A–6
		58–72	Loam or clay loam	CL	A–6
Ayrshire: Ay	1–3	0–13	Fine sandy loam	SM or ML	A–4
		13–56	Sandy clay loam and fine sandy loam.	SC or CL	A–6
		56–74	Fine sand and some silt	SM	A–2–4 or A–4
Bartle: Ba	1–3	0–14	Silt loam	ML–CL	A–4
		14–26	Heavy silt loam	ML–CL	A–4 or A–6
		26–40	Heavy silt loam to light silty clay loam (fragipan).	ML or CL	A–4, A–6, or A–7
		40–72	Silty clay loam stratified with sandy loam.	ML or CL	A–4, A–6, or A–7
Bloomfield: BlB, BlC, BlD.	>6	0–7	Loamy fine sand	SM	A–2
		7–32	Loamy fine sand or fine sand	SP or SM	A–3 or A–2
		32–80	Fine sand containing bands of sandy loam to light sandy clay loam.	SP–SM or SM	A–2 or A–3
Borrow pits: Bp. Properties too variable to be estimated.					
Camden: CaA, CaB	>6	0–10	Silt loam	ML or CL	A–4 or A–6
		10–42	Silty clay loam or clay loam	CL or CH	A–6 or A–7
		42–72	Stratified loamy sand, sandy loam, sandy clay loam, fine sand, and silt.	ML or CL	A–4
Cincinnati: CnC2, CnC3, CnD3.	>6	0–8	Silt loam	ML or CL	A–4
		8–27	Silty clay loam	CL	A–6
		27–46	Light silty clay loam or light clay loam (fragipan).	CL	A–6
		46–99	Loam or clay loam	CL	A–6
Cory: Co	1–3	0–15	Silt loam	ML or CL	A–4 or A–6
		15–45	Silty clay loam	CL	A–6
		45–75	Silt loam	CL or ML	A–6 or A–4

See footnote at end of table.

significant to engineering

the symbol < means less than]

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Frost action	Shrink-swell potential
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)					
			Inches per hour	*Inches per inch of soil*	*pH value*		
100	75–90	20–30	6.3–20.0	0.10–0.12	5.6–7.3	Low	Low.
100	65–80	3–30	6.3–20.0	<0.08	5.6–7.3	Low	Low.
100	75–90	5–30	6.3–20.0	<0.08	5.6–7.3	Low	Low.
100	90–100	80–95	0.63–2.0	0.22–0.24	5.1–6.6	Moderate to high.	Low.
100	95–100	85–95	0.63–2.0	0.18–0.20	4.5–6.0	Moderate to high.	Low.
100	90–100	85–95	0.63–2.0	0.20–0.22	5.6–7.3	Moderate to high.	Low.
100	95–100	85–95	0.63–2.0	0.21–0.23	6.1–7.3	Moderate	Moderate.
100	95–100	85–95	0.63–2.0	0.18–0.20	6.1–7.3	Moderate	Moderate.
100	95–100	85–95	0.63–2.0	0.19–0.21	6.1–7.3	Moderate	Moderate.
100	90–100	85–95	0.63–2.0	0.22–0.24	5.6–6.6	High	Low.
100	95–100	85–95	0.63–2.0	0.18–0.20	5.1–5.5	High	Low.
100	90–100	75–90	<0.06	[1] 0.06–0.08	4.6–5.5	Moderate	Low.
100	85–100	65–80	0.63–2.0	[1] 0.14–0.19	5.1–6.0	High	Low.
100	70–85	40–55	2.0–6.3	0.16–0.18	6.6–7.0	Moderate	Low.
100	80–90	35–60	0.63–2.0	0.16–0.18	5.4–6.0	High	Moderate.
100	70–85	20–40	0.63–2.0	0.14–0.16	6.1–7.3	Moderate	Low.
100	90–100	70–90	0.63–2.0	0.22–0.24	5.1–6.0	High	Low.
100	95–100	75–95	0.63–2.0	0.22–0.24	4.6–5.5	High	Low to moderate.
100	90–100	75–90	<0.06	[1] 0.06–0.08	5.1–5.5	High	Low to moderate.
100	90–100	75–90	0.06–2.0	[1] 0.19–0.21	5.1–6.0	High	Low to moderate.
100	75–90	20–30	6.3–20.0	0.10–0.12	5.6–7.3	Low	Low.
100	75–90	3–30	6.3–20.0	<0.08	5.6–7.3	Low	Low.
100	65–80	5–30	6.3–20.0	0.08–0.12	5.6–7.3	Low	Low.
100	90–100	85–95	0.63–2.0	0.22–0.24	5.6–6.6	High	Low.
100	95–100	85–95	0.63–2.0	0.15–0.20	5.1–6.0	High	Moderate.
95–100	85–95	65–75	2.0–6.3	0.19–0.21	5.5–7.8	High	Low.
100	90–100	85–95	0.63–2.0	0.22–0.24	5.6–6.6	Moderate to high.	Low.
100	95–100	85–95	0.63–2.0	0.18–0.20	5.1–5.5	Moderate to high.	Low to moderate.
100	90–100	70–90	<0.06	[1] 0.06–0.08	4.6–5.5	Moderate	Low to moderate.
100	85–100	65–80	0.63–2.0	[1] 0.14–0.19	5.1–6.0	Moderate	Low to moderate.
100	90–100	75–95	0.63–2.0	0.22–0.24	5.1–6.6	High	Low.
100	95–100	85–95	0.06–0.2	0.18–0.20	5.1–6.0	High	Moderate.
100	90–100	75–95	0.63–2.0	0.20–0.22	5.6–6.5	High	Moderate to low.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface (representative profile)	Classification		
			Dominant USDA texture	Unified	AASHO
	Feet	*Inches*			
Crane: Cr	1-3	0-12	Silt loam	ML or CL	A-4 or A-6
		12-49	Silty clay loam, clay loam, or sandy clay loam.	CL or CH	A-6 or A-7
		49-70	Mainly sand and loamy sand; some thin to thick strata of gravel or sandy clay loam.	SP or SM	A-2 or A-3
Eel: Ee	3-6	0-8	Silt loam	ML or CL	A-4 or A-6
		8-41	Silt loam or loam	ML or CL	A-4 or A-6
		41-61	Stratified silt loam, silty clay loam, fine sandy loam, and sand.	ML, CL, or SM	A-4
Elston: ElA, ElB	>6	0-20	Sandy loam	SM	A-2 or A-4
		20-45	Light sandy clay loam to loamy sand.	SC or SM	A-2 or A-4
		45-72	Loamy sand to sand	SM or SP-SM	A-1 or A-2
Fincastle: Fn	1-3	0-10	Silt loam	ML or CL	A-4 or A-6
		10-55	Silty clay loam or clay loam	CL or CH	A-6 or A-7
		55-66	Loam	ML or CH	A-4 or A-6
Fox: FoA, FoB2, FxC3	>6	0-8	Sandy loam or clay loam	SM CL	A-2 or A-4 A-6
		8-38	Clay loam, gravelly clay loam, sandy clay loam.	CL or SC	A-6 or A-7
		38-62	Sand, gravel, and gravelly sand	SM-SP or GW-GM	A-1
Genesee: Ge, Gf	>6	0-9	Silt loam or fine sandy loam	ML or CL	A-4 or A-6
				ML or SM	A-4
		9-34	Silt loam or loam, or both	ML or CL	A-4 or A-6
		34-72	Stratified loam, silt loam, and sandy loam.	ML	A-4
Gravel pits: Gp. Properties too variable to be estimated.					
Hennepin: HeG	>6	0-6	Loam	ML or CL	A-4 or A-6
		6-16	Loam or light clay loam	ML or CL	A-4 or A-6
		16-60	Loam	ML or CL	A-4 or A-6
Hickory: HkE, HkF	>6	0-11	Loam	ML or CL	A-4 or A-6
		11-48	Clay loam, silty clay loam, or loam	CL, CH, or SC	A-6 or A-7
		48-60	Loam	CL, SM, or SC	A-6
Iva: IvA, IvB	1-3	0-11	Silt loam	ML or CL	A-4 or A-6
		11-55	Silty clay loam	CL	A-6
		55-80	Silt loam	CL or ML	A-6 or A-4
Made land: Ma. Properties too variable to be estimated.					

See footnote at end of table.

significant to engineering—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Frost action	Shrink-swell potential
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)					
			Inches per hour	*Inches per inch of soil*	*pH value*		
100	95–100	80–90	0. 63–2. 0	0. 22–0. 24	5. 6–6. 5	High	Low.
96–100	85–95	70–80	0. 63–2. 0	0. 15–0. 20	5. 6–6. 0	High	Moderate.
95–100	70–80	3–30	6. 30–20. 0	0. 08–0. 17	5. 6–7. 8	Moderate	Low.
100	95–100	85–95	0. 63–2. 0	0. 22–0. 24	6–1–7. 3	Moderate to high.	Low.
100	95–100	65–85	0. 63–2. 0	0. 17–0. 22	6. 1–7. 3	Moderate to high.	Low.
100	70–90	40–80	0. 63–2. 0	0. 19–0. 21	7. 4–8. 4	Moderate	Low.
100	65–85	25–50	2. 00–6. 3	0. 13–0. 15	4. 6–6. 5	Low to moderate.	Low.
100	60–80	20–45	0. 63–2. 0	0. 11–0. 16	5. 1–6. 0	Low to moderate.	Low.
100	45–70	10–30	6. 3–20. 0	0. 05–0. 10	5. 6–6. 5	Low to moderate.	Low.
100	95–100	85–95	0. 63–2. 0	0. 22–0. 24	5. 1–6. 5	High	Low.
100	85–95	70–95	0. 06–0. 2	0. 15–0. 20	5. 1–6. 0	Moderate to high.	Moderate.
95–100	75–85	55–70	0. 2 – 0. 63	0. 17–0. 19	7. 4–8. 4	Moderate to high.	Low.
95–100	60–70	30–40	2. 0–6. 3	0. 13–0. 15	5. 6–6. 6	Moderate	Low.
80–90	70–80	50–60	0. 63–2. 0	0. 17–0. 19	5. 6–6. 6	Moderate	Moderate.
75–85	65–75	45–55	0. 63–2. 0	0. 17–0. 21	5. 1–6. 1	Moderate	Moderate.
20–70	15–30	5–10	>20. 0	<0. 08	7. 4–8. 4	Low	Low.
100	90–100	75–85	0. 63–2. 0	0. 22–0. 24	6. 1–7. 3	Moderate to high.	Low.
100	70–80	45–55	2. 0–6. 3	0. 13–0. 15	6. 1–7. 3	Moderate to high.	Low.
100	90–100	75–85	0. 63–2. 0	0. 17–0. 19	6. 6–8. 4	Moderate to high.	Low.
100	70–80	55–70	0. 63–2. 0	0. 19–0. 21	7. 4–8. 4	Moderate to high.	Low.
100	80–95	70–85	0. 63–2. 0	0. 20–0. 22	6. 1–6. 5	Moderate to high.	Low.
100	75–95	65–80	0. 63–2. 0	0. 17–0. 19	6. 6–7. 3	Moderate	Low.
100	75–85	65–75	0. 63–2. 0	0. 05–0. 19	7. 3–8. 4	Moderate	Low.
100	80–95	65–80	0. 63–2. 0	0. 20–0. 22	4. 6–5. 5	Moderate	Low.
100	90–100	45–90	0. 63–2. 0	0. 15–0. 22	5. 1–6. 0	Low to moderate.	Moderate.
100	85–95	45–75	0. 63–2. 0	0. 05–0. 19	7. 4–8. 4	Low to moderate.	Low.
100	90–100	75–95	0. 63–2. 0	0. 22–0. 24	5. 1–7. 3	High	Low.
100	95–100	85–95	0. 06–0. 2	0. 18–0. 20	5. 1–6. 0	High	Moderate.
100	90–100	75–95	0. 63–2. 0	0. 20–0. 22	5. 6–6. 6	High	Moderate to low.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface (representative profile)	Classification		
			Dominant USDA texture	Unified	AASHO
	Feet	*Inches*			
Millsdale: Md	[2] 0–1	0–18	Silty clay loam	CL or CH	A–7
		18–36	Silty clay loam or clay loam	CL or CH	A–6 or A–7
		36–60	Limestone bedrock.		
Muren: MuA, MuB2	3–6	0–7	Silt loam	ML or CL	A–4 or A–6
		7–53	Silty clay loam to heavy silt loam	CL	A–6
		53–90	Silt loam or silt	CL or ML	A–6 or A–4
Negley: NeE, NeF	>6	0–6	Loam	CL	A–4
		6–57	Sandy clay loam to clay loam	SC or CL	A–6
		57–81	Stratified sandy loam and sandy clay loam.	SM or SC	A–2 or A–4
Parke: PaB2, PaD2	>6	0–6	Silt loam	ML or CL	A–4
		6–28	Silty clay loam	CL	A–6
		28–55	Clay loam and sandy clay loam	SC or CL	A–6
		55–85	Sandy clay loam and loamy sand	SC or SM	A–2–4 or A–4
Petrolia: Pe	0–1	0–8	Silty clay loam	CL	A–6
		8–64	Silty clay loam	CL	A–6
		64–77	Silt loam or silty clay loam	ML or CL	A–4 or A–6
Princeton: PrB, PrC2, PrD2, PrE2.	>6	0–8	Fine sandy loam	SM or ML	A–4
		8–41	Sandy clay loam and sandy loam	SC, SM, or ML	A–4 or A–6
		41–60	Sandy loam and loamy sand	SM	A–4
		60–80	Stratified loamy sand and fine sand	SM	A–4
Proctor: Pt	>6	0–19	Silt loam	ML or CL	A–4 or A–6
		19–58	Silty clay loam to sandy clay loam	CL or CH	A–6 or A–7
		58–78	Stratified loamy sand, sandy clay loam, medium sand, and silt.	SM or CL	A–4 or A–6
Ragsdale: Ra	[2] 0–1	0–16	Silt loam over silty clay loam	ML or CL	A–4 or A–6
		16–40	Silty clay loam	CL or CH	A–6 or A–7
		40–60	Light silty clay loam that grades to silt loam.	ML or CL	A–4 or A–6
Randolph: RdA	1–3	0–10	Silt loam	ML or CL	A–4
		10–37	Light to heavy silty clay loam	CL or CH	A–6 or A–7
		37–60	Limestone bedrock.		
Reesville: Re	1–3	0–10	Silt loam	ML or CL	A–4
		10–42	Silty clay loam to silt loam	CL or CH	A–6 or A–7
		42–89	Silt loam to silt	CL or ML	A–6 or A–4
Rensselaer: Rg, Rn	[2] 0–1	0–12	Loam or clay loam	ML or CL	A–4 or A–6
		12–62	Clay loam or sandy clay loam, or both.	CL or SC	A–6
		62–72	Stratified fine sandy loam, silt loam, and clay loam.	ML or CL	A–4 or A–6
Rodman: RoG	>6	0–7	Gravelly loam	ML	A–4
		7–14	Gravelly loam	ML	A–4
		14–60	Gravel, sand, and gravelly sand	SP–SM or GW–GM	A–1
Russell: RuB2, RuC2, RuC3, RuD2.	>6	0–8	Silt loam	ML or CL	A–4 or A–6
		8–48	Silty clay loam or clay loam, or both	CL or CH	A–6 or A–7
		48–80	Light clay loam to loam	CL	A–6
Shoals: Sh	1–3	0–11	Silt loam	ML or CL	A–4 or A–6
		11–53	Silt loam or loam	ML or CL	A–4 or A–6
		53–78	Stratified layers of silt loam, loam, and sand.	ML	A–4

See footnote at end of table.

significant to engineering—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Frost action	Shrink-swell potential
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)					
			Inches per hour	*Inches per inch of soil*	*pH value*		
100	95–100	85–95	0. 06–0. 2	0. 21–0. 23	6. 1–7. 3	High	Moderate.
100	90–100	75–95	0. 06–0. 2	0. 15–0. 20	6. 6–7. 8	High	Moderate.
100	90–100	75–95	0. 63–2. 0	0. 22–0. 24	5. 6–6. 6	High	Low.
100	95–100	85–95	0. 2–0. 63	0. 18–0. 20	5. 1–6. 1	High	Low.
100	90–100	80–95	0. 63–2. 0	0. 20–0. 22	5. 6–7. 3	High	Low.
95–100	85–95	60–75	0. 63–2. 0	0. 20–0. 22	5. 1–5. 5	Moderate	Low.
90–100	85–95	40–55	0. 63–2. 0	0. 15–0. 19	4. 5–5. 5	Moderate	Low.
90–100	65–70	30–50	2. 0–6. 3	0. 11–0. 17	4. 5–6. 0	Moderate	Low.
100	90–100	75–90	0. 63–2. 0	0. 22–0. 24	5. 1–6. 6	Moderate	Low.
100	95–100	75–90	0. 63–2. 0	0. 18–0. 20	4. 5–5. 0	Moderate	Moderate.
100	90–95	35–60	0. 63–2. 0	0. 15–0. 19	4. 5–5. 5	Moderate	Moderate.
90–100	55–85	25–50	2. 00–6. 3	0. 10–0. 17	5. 1–6. 5	Moderate	Low.
100	95–100	85–95	0. 06–0. 2	0. 21–0. 23	5. 6–7. 3	High	Moderate.
100	95–100	85–95	0. 06–0. 2	0. 18–0. 20	5. 6–7. 3	High	Moderate.
100	95–100	75–95	0. 2–0. 63	0. 15–0. 22	5. 6–7. 8	High	Moderate.
100	90–100	40–60	2. 0–6. 3	0. 16–0. 18	6. 6–7. 3	Moderate	Low.
100	80–90	35–55	0. 63–2. 0	0. 12–0. 18	5. 1–6. 0	Moderate	Moderate.
100	60–70	35–50	2. 0–6. 3	0. 09–0. 14	5. 6–6. 6	Moderate	Low.
100	70–80	15–50	6. 3–20. 0	0. 05–0. 10	6. 1–7. 8	Moderate	Low.
100	90–100	85–95	0. 63–2. 0	0. 22–0. 24	5. 6–6. 6	Moderate to high.	Low.
100	95–100	85–95	0. 63–2. 0	0. 16–0. 20	5. 1–6. 5	Moderate to high.	Moderate.
95–100	60–90	40–70	0. 63–2. 0	0. 19–0. 21	6. 1–7. 8	Moderate	Low.
100	95–100	75–95	0. 06–2. 0	0. 22–0. 24	6. 1–7. 3	High	Low to moderate.
100	95–100	85–95	0. 06–0. 2	0. 18–0. 20	6. 1–7. 3	High	Moderate.
100	95–100	75–95	0. 2–0. 63	0. 18–0. 22	6. 6–8. 4	High	Low.
100	90–100	70–90	0. 63–2. 0	0. 22–0. 24	5. 6–6. 0	High	Low.
100	95–100	85–95	0. 06–0. 2	0. 18–0. 20	5. 1–7. 3	High	Moderate.
100	90–100	70–90	0. 63–2. 0	0. 22–0. 24	6. 0–7. 3	High	Low.
100	95–100	85–95	0. 06–0. 2	0. 18–0. 22	5. 6–7. 3	High	Moderate to low.
100	95–100	70–95	0. 2–0. 63	0. 20–0. 22	6. 6–8. 4	High	Low.
95–100	90–100	80–95	0. 63–2. 0	0. 20–0. 23	6. 6–7. 3	High	Low to moderate.
100	80–95	45–75	0. 06–0. 2	0. 15–0. 19	6. 6–7. 8	High	Moderate.
100	60–95	35–75	2. 0–6. 3	0. 19–0. 21	7. 9–8. 4	High	Low.
65–80	50–65	35–50	>20. 0	0. 10–0. 15	6. 6–7. 3	Moderate	Low.
65–80	50–65	35–50	>20. 0	0. 08–0. 12	6. 6–7. 3	Moderate	Low.
20–70	15–30	5–10	>20. 0	<0. 08	7. 4–8. 4	Low	Low.
100	90–100	85–95	0. 63–2. 0	0. 22–0. 24	5. 6–6. 5	Moderate to high.	Low.
100	90–100	80–95	0. 63–2. 0	0. 16–0. 18	5. 6–6. 0	Moderate	Moderate.
100	85–95	70–90	0. 63–2. 0	0. 14–0. 19	7. 4–8. 4	Moderate	Low.
100	90–100	75–85	0. 63–2. 0	0. 22–0. 24	6. 1–7. 3	High	Low.
100	90–100	75–85	0. 63–2. 0	0. 17–0. 22	6. 1–7. 3	High	Low.
100	70–80	55–70	0. 63–2. 0	0. 19–0. 21	6. 5–8. 4	High	Low.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface (representative profile)	Classification		
			Dominant USDA texture	Unified	AASHO
	Feet	*Inches*			
Sloan: So	[2] 0–1	0–13	Clay loam	CL	A–6 or A–7
		13–41	Silty clay loam to loam or sandy clay loam.	CL, CH, or SC	A–6 or A–7
		41–65	Stratified sandy clay loam, gravelly sandy loam, and loam.	ML	A–4
Strip mines: St. Properties too variable to be estimated.					
Tippecanoe: Tp	3–6	0–17	Silt loam	ML	A–4
		17–54	Clay loam, silty clay loam, or sandy clay loam.	CL	A–6
		54–80	Stratified layers of loamy sand, sandy clay loam, sand, and some gravel.	SM or SC	A–2–4 or A–6
Vincennes: Vn	0–1	0–10	Loam	ML or CL	A–4 or A–6
		10–50	Clay loam and sandy clay loam	CL	A–6
		50–70	Variable; stratified layers of fine sand, sandy clay loam, clay loam, and lenses of clay.	ML or CL	A–4 or A–6
Wakeland: Wa	1–3	0–8	Silt loam	ML	A–4
		8–38	Silt loam	ML	A–4
		38–72	Stratified layers of silt loam, loam, and sandy loam.	ML or SM	A–4 or A–2
Warsaw: WrA, WrB2	>6	0–12	Sandy loam over gravelly sandy clay loam.	SM or SC	A–2–4 or A–6
		12–45	Clay loam or gravelly clay loam and sandy clay loam or gravelly and sandy clay loam.	CL or SC	A–6 or A–7
		45–80	Sand, gravel, or gravelly sand	SM–SP or GW–GM	A–1
Washtenaw: Ws	[2] 0–1	0–22	Silt loam	ML or CL	A–4 or A–6
		22–64	Silty clay loam or clay loam	CL	A–6
Westland: Wt	[2] 0–1	0–18	Clay loam	CL or CH	A–6 or A–7
		18–72	Clay loam to sandy clay loam or gravelly clay loam.	CL or SC	A–6 or A–7
		72–82	Sand, gravel, or gravelly sand	SM–SP or GW–GM	A–1
Whitaker: Wx	1–3	0–13	Silt loam	ML–CL	A–4 or A–6
		13–43	Clay loam or loam	CL or CH	A–6 or A–7
		43–66	Stratified loam, silt, and fine sand	ML	A–4
Xenia: XeB2	3–6	0–8	Silt loam	ML or CL	A–4 or A–6
		8–55	Silty clay loam, and clay loam	CL	A–6 or A–7
		55–90	Loam	ML or CL	A–4 or A–6
Zipp: Zp	[2] 0–1	0–8	Silty clay	CH	A–7
		8–48	Silty clay	CH	A–7
		48–65	Silty clay to silty clay loam	CH	A–7

---

[1] Fragipan limits water availability to the plants by restricting water movement and root penetration.

significant to engineering—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Frost action	Shrink-swell potential
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)					
			Inches per hour	*Inches per inch of soil*	*pH value*		
100	90–100	70–80	0. 63–2. 0	0. 17–0. 19	6. 1–7. 3	High	Low to moderate.
100	90–100	45–65	0. 63–2. 0	0. 16–0. 20	6. 1–7. 3	High	Moderate.
100	70–80	55–70	0. 63–2. 0	0. 19–0. 21	6. 6–8. 4	High	Low.
100	90–100	70–90	0. 63–2. 0	0. 22–0. 24	5. 6–6. 5	Moderate to high.	Low.
90–100	80–95	70–80	0. 63–2. 0	0. 15–0. 20	5. 1–6. 0	Moderate	Moderate.
80–90	60–70	30–50	2. 0–6. 3	0. 19–0. 21	5. 1–7. 3	Moderate	Low.
100	90–100	70–90	0. 2–0. 63	0. 20–0. 22	5. 6–7. 3	High	Low to moderate.
100	90–100	70–80	0. 06–0. 2	0. 15–0. 19	5. 1–6. 0	High	Moderate.
100	75–95	50–80	2. 0–6. 3	0. 19–0. 21	5. 1–6. 0	High	Low to moderate.
100	95–100	80–90	0. 63–2. 0	0. 22–0. 24	5. 6–7. 3	High	Low.
100	95–100	80–90	0. 63–2. 0	0. 20–0. 22	5. 6–7. 3	High	Low.
100	75–90	30–65	0. 63–2. 0	0. 19–0. 21	5. 6–7. 3	High	Low.
90–100	60–70	30–50	0. 63–2. 0	0. 13–0. 15	5. 6–6. 5	Moderate	Low.
60–90	70–90	35–60	0. 63–2. 0	0. 15–0. 19	5. 6–6. 6	Moderate	Moderate.
30–70	15–30	5–10	>20. 0	<0. 08	7. 4–8. 4	Low	Low.
100	90–100	85–95	0. 63–2. 0	0. 22–0. 24	6. 6–7. 3	High	Low.
100	85–95	80–90	0. 06–0. 2	0. 15–0. 20	6. 6–7. 3	High	Low.
100	90–100	70–80	0. 2–0. 63	0. 17–0. 19	6. 1–7. 3	High	Moderate.
90–100	85–95	45–90	0. 06–0. 2	0. 15–0. 19	6. 1–7. 3	High	Moderate.
40–70	15–30	5–10	>20. 0	<0. 08	6. 6–8. 4	High	Low.
100	90–100	85–95	0. 63–2. 0	0. 22–0. 24	5. 6–6. 6	Moderate to high.	Low.
100	95–100	85–95	0. 63–2. 0	0. 15–0. 19	4. 5–6. 1	Moderate to high.	Moderate.
100	80–90	70–85	0. 63–2. 0	0. 19–0. 21	5. 1–7. 8	Moderate to high.	Low.
100	90–95	85–95	0. 63–2. 0	0. 22–0. 24	6. 1–6. 6	Moderate to high.	Low.
100	85–95	80–95	0. 2–0. 63	0. 15–0. 20	5. 1–6. 6	Moderate to high.	Moderate.
95–100	70–80	60–70	0. 2–2. 0	0. 05–0. 19	7. 4–8. 4	Moderate to high.	Low.
100	95–100	90–95	0. 06–0. 2	0. 12–0. 14	6. 1–7. 3	High	High.
100	95–100	90–95	<0. 06	0. 11–0. 13	6. 1–7. 8	High	High.
100	95–100	85–95	<0. 06	0. 10–0. 20	6. 6–8. 4	High	High.

---

[2] Ponded.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—		
	Topsoil	Sand and gravel	Road fill
Ade: AdB, AdC	Poor in surface layer and subsoil: sandy; droughty; subject to soil blowing.	Fair for sand; contains variable amounts of fines; is source of gravel at a depth below 60 inches on terraces in places; not suitable as a source of gravel on uplands.	Good: low shrink-swell potential; good shear strength; fair stability and compaction; slight to very slight compressibility.
Alford: AlB2, AlC2, AlC3, AlD2, AlD3, AlE2, AlF.	Good in surface layer where not eroded or too steep. Poor to fair in subsoil: somewhat sticky when wet; low to moderate organic-matter content.	Not suitable	Poor in subsoil and underlying material: medium compressibility; low shrink-swell potential; fair stability; fair to poor shear strength; fair compaction.
Armiesburg: Ar	Fair in surface layer and subsoil: sticky when wet.	Not suitable	Poor in subsoil and underlying material: moderate shrink-swell potential; fair to poor shear strength; fair compaction; susceptible to frost heave; fair stability; high compressibility.
Ava: AvB2	Good in surface layer: thin if eroded. Fair in upper part of subsoil and poor in lower part: fragipan.	Not suitable	Poor to fair in subsoil and underlying material: medium to high compressibility; fair to good shear strength and stability; low shrink-swell potential; high susceptibility to frost heave.
Ayrshire: Ay	Good or fair in surface layer: moderate to low organic-matter content. Fair or poor in subsoil: seasonal high water table; sticky when wet.	Not suitable	Fair to poor in subsoil and underlying material: moderate to low shrink-swell potential; fair to poor shear strength and compaction; susceptible to frost heave; fair to poor stability; seasonal high water table.

properties of the soils

Soil features affecting—					
Highway location	Pond reservoir areas	Dams, dikes, levees, and embankments	Grassed waterways	Agricultural drainage	Terraces and diversions
Cuts and fills generally needed; loose sand; difficult to vegetate; subject to severe soil blowing; loose sand hinders trafficability.	Rapid seepage; too porous to hold water.	Fair stability and compaction; rapid seepage when compacted; fair to poor resistance to piping; slight to very slight compressibility.	Generally not needed; porous sand; little runoff; difficult to establish and maintain vegetation in sandy, droughty material.	Not needed; natural drainage is somewhat excessive.	Generally not needed; porous sand; little runoff; difficult to establish and maintain vegetation.
Cuts and fills needed; erodible where exposed on embankments; susceptible to frost heave.	Moderate seepage; other features are generally favorable.	Subsoil and underlying material: fair stability and compaction; low to moderate permeability when compacted; fair resistance to piping.	Severe hazard of erosion until grass cover is established.	Not needed; well-drained soil.	Highly erodible; not suited where slopes are more than 12 percent.
Subject to flooding; susceptible to frost heave.	Subject to flooding; moderate to slow seepage.	Subsoil and underlying material: fair stability and compaction characteristics; low permeability when compacted; high compressibility; good resistance to piping; moderate shrink-swell potential.	Not needed; level topography.	Not needed; well-drained soil.	Not needed; level topography.
Cuts and fills needed; seepage is likely in cuts; slopes are erodible; high susceptibility to frost heave.	Slight or no seepage; cuts below a depth of 5 feet increase possibility of seepage.	Fair stability; fair compaction; low to moderate permeability when compacted; fair resistance to piping.	Difficult to obtain good vegetative cover if fragipan material is exposed.	Not needed; moderately well-drained soil.	Difficult to establish good vegetative cover where fragipan material is exposed.
Seasonal high water table; susceptible to frost heave.	Subsoil: seasonal high water table; moderate permeability; moderate seepage in subsoil; moderate to rapid seepage in underlying material.	Subsoil: fair stability and compaction; moderate shrink-swell potential; medium to high compressibility; subject to piping; fair to poor shear strength; low permeability when compacted. Underlying material: poor stability and compaction; fair to poor shear strength; medium compressibility; moderate permeability when compacted; poor resistance to piping.	Generally not needed except where a concentrated flow of water comes from adjoining higher areas; soil features are favorable in such areas.	Seasonal high water table; moderate permeability.	Generally not needed; nearly level topography.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—		
	Topsoil	Sand and gravel	Road fill
Bartle: Ba	Fair in surface layer: low to moderate organic-matter content. Poor in subsoil: fragipan.	Not suitable	Fair to poor: fair to poor shear strength; medium to high compressibility; fair stability and compaction; moderate to high shrink-swell potential; high susceptibility to frost heave; somewhat poorly drained.
Bloomfield: BlB, BlC, BlD	Poor in surface layer and subsoil: sand; droughty; subject to soil blowing.	Good to fair source of sand: generally poorly graded; bands of finer material below a depth of 20 inches; not suitable as a source of gravel.	Good: low shrink-swell potential; good to fair shear strength; poor to fair stability; fair to good compaction; slight compressibility.
Borrow pits: Bp. No interpretations; properties too variable.			
Camden: CaA, CaB	Good in surface layer. Fair in subsoil: somewhat sticky when wet.	Not suitable	Poor in subsoil: moderate shrink-swell potential; fair to poor shear strength; fair to poor compaction; fair stability; medium to high compressibility. Fair in underlying material: fair shear strength and compaction; medium compressibility; low shrink-swell potential; fair stability.
Cincinnati: CnC2, CnC3, CnD3.	Fair in surface layer: low to moderate in organic matter content. Poor in subsoil: fragipan; low in organic-matter content.	Not suitable	Poor in subsoil and underlying material: fair shear strength; fair to good stability and compaction; medium to high compressibility; moderate to high susceptibility to frost heave; well drained.

properties of the soils—Continued

Soil features affecting—					
Highway location	Pond reservoir areas	Dams, dikes, levees, and embankments	Grassed waterways	Agricultural drainage	Terraces and diversions
Seasonal high water table; high susceptibility to frost heave; level topography.	Seasonal high water table; very slowly permeable fragipan; nearly level slopes.	Fair stability and compaction; moderate to low permeability when compacted; medium to high compressibility; fair resistance to piping.	Generally not needed; nearly level topography.	Seasonal high water table; very slowly permeable fragipan.	Generally not needed; nearly level topography.
Cuts and fills generally needed; loose and droughty; difficult to vegetate; unvegetated areas subject to severe soil blowing; loose sand impairs trafficability.	Rapid seepage; sand is too porous to hold water.	Fair to poor stability; fair compaction; moderate to high permeability when compacted; slight compressibility; fair to poor resistance to piping.	Not needed; porous sand; little runoff.	Not needed; natural drainage is somewhat excessive.	Not needed; porous sand; little runoff.
Cuts and fills needed on gently sloping soils in some places; subject to frost heave.	Moderate seepage; stratified sand and silt.	Subsoil: fair stability; fair to poor compaction; moderate shrink-swell potential; medium to high compressibility; good resistance to piping; fair to poor shear strength; low permeability when compacted. Underlying material: fair stability; fair shear strength and compaction; moderate permeability when compacted; medium compressibility; fair resistance to piping.	Hazard of erosion during construction.	Not needed; natural drainage is adequate.	No limitations if topography is favorable.
Need for cuts and fills; high susceptibility to frost heave; well drained, but seepage is likely in deep cuts; moderate erodibility.	Slow seepage; features generally favorable.	Fair to good stability and compaction; low permeability when compacted; good resistance to piping; medium to high compressibility.	Very slow permeability in fragipan at a depth of about 24 inches.	Not needed; well-drained soil.	Very slow permeability in fragipan at a depth of about 24 inches.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—		
	Topsoil	Sand and gravel	Road fill
Cory: Co	Good in surface layer. Poor to fair in subsoil: somewhat sticky when wet; seasonal high water table.	Not suitable	Fair to poor in subsoil and underlying material: fair to poor shear strength; susceptible to frost heave; fair stability; seasonal high water table; medium compressibility.
Crane: Cr	Good in surface layer. Fair in subsoil: somewhat sticky when wet.	Fair to good below a depth of 42 to 72 inches.	Poor to fair in subsoil: fair to poor shear strength and compaction; medium to high compressibility; moderate shrink-swell potential; fair stability; seasonal high water table. Good in underlying material: seasonal high water table.
Eel: Ee	Good in surface layer: subject to stream flooding.	Not suitable	Fair to poor in subsoil and underlying material: fair to poor shear strength and compaction; medium to high compressibility; low shrink-swell potential; fair stability; seasonal high water table.
Elston: ElA, ElB	Good to fair in surface layer: sandy loam and fine sandy loam; somewhat droughty. Fair in subsoil: low in organic-matter content.	Good source for sand below a depth of 60 inches; gravel present in some places.	Good
Fincastle: Fn	Good in surface layer. Fair to poor in subsoil: sticky when wet; low in organic-matter content; seasonal high water table.	Not suitable	Fair to poor in subsoil and underlying material: moderate to low shrink-swell potential; fair to poor shear strength and compaction; susceptible to frost heave; fair to poor stability; seasonal high water table.

properties of the soils—Continued

Soil features affecting—					
Highway location	Pond reservoir areas	Dams, dikes, levees, and embankments	Grassed waterways	Agricultural drainage	Terraces and diversions
Unstable when wet; high susceptibility to frost heave; seepage in cuts; seasonal high water table.	Moderate seepage; underlain by permeable loess; seasonal high water table.	Fair to poor shear strength; fair resistance to piping; medium compressibility; moderate to low permeability when compacted; fair stability.	No major construction problems.	Seasonal high water table; slow permeability.	No major construction problems.
Seasonal high water table; susceptible to frost heave; sandy and gravelly underlying material.	Seasonal high water table; underlying material very porous.	Subsoil: fair to poor shear strength and compaction; low permeability when compacted; medium to high compressibility; good resistance to piping; moderate shrink-swell potential. Underlying material: rapid seepage; fair to good stability; good compaction.	Generally not needed.	Seasonal high water table; moderate permeability.	Generally not needed.
Subject to flooding; susceptible to frost heave.	Subject to flooding; seasonal high water table; moderate to slow seepage.	Subsoil and underlying material: fair stability; fair to poor shear strength and compaction; moderate to low permeability when compacted; medium to high compressibility; fair resistance to piping.	Generally not needed; level topography.	Subject to flooding; moderate permeability.	Not needed; level topography.
Low to moderate susceptibility to frost heave; subject to soil blowing.	Rapid seepage; too sandy to hold water.	Fair stability; fair to good compaction; moderate permeability when compacted; slight compressibility; fair to poor resistance to piping.	Not needed; porous soil, little runoff.	Not needed; well-drained soil.	Not needed; porous soil, little runoff.
Seasonal high water table; susceptible to frost heave; medium to high compressibility.	Seasonal high water table; slow permeability; moderate to slow seepage.	Subsoil and underlying material: fair to poor stability and compaction; low permeability when compacted; medium to high compressibility; good resistance to piping; low to moderate shrink-swell potential; fair to poor shear strength.	All features favorable.	Seasonal high water table; slow permeability.	All features favorable.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—		
	Topsoil	Sand and gravel	Road fill
Fox: FoA, FoB2, FxC3	Fair or good in surface layer. Poor or fair in subsoil: somewhat gravelly; sticky when wet.	Good below a depth of 24 to 48 inches.	Poor in subsoil: fair shear strength; medium compressibility; moderate shrink-swell potential; good to fair compaction; fair stability. Very good in underlying material: good to fair shear strength; slight compressibility; fair to good compaction; fair to poor stability.
Genesee: Ge, Gf	Good: subject to stream flooding.	Not suitable	Fair to poor in subsoil and underlying material: fair to poor shear strength and compaction; medium to high compressibility; low shrink-swell potential; fair stability.
Gravel pits: Gp. No interpretations; properties too variable.			
Hennepin: HeG	Fair in surface layer: thin; steep slopes. Fair or poor in subsoil: low in organic-matter content.	Not suitable	Subsoil and underlying material: fair to poor shear strength and compaction; medium to high compressibility; low shrink-swell potential; fair stability.
Hickory: HkE, HkF	Fair to poor in surface layer and subsoil: generally steep and eroded; thin surface soil or wooded.	Not suitable	Poor in subsoil and underlying material: fair to poor shear strength; medium to high compressibility; moderate shrink-swell potential and susceptibility to frost heave; fair compaction and stability; well drained; poor accessibility; steep slopes.
Iva: IvA, IvB	Good in surface layer. Poor to fair in subsoil: somewhat sticky when wet; seasonal high water table.	Not suitable	Fair to poor in subsoil and underlying material: fair to poor shear strength; susceptible to frost heave; fair stability; seasonal high water table; medium compressibility.

properties of the soils—Continued

Soil features affecting—					
Highway location	Pond reservoir areas	Dams, dikes, levees, and embankments	Grassed waterways	Agricultural drainage	Terraces and diversions
Well drained; loose sand makes for easy excavation but sometimes hinders hauling; cuts and fills often needed; difficult to vegetate exposed gravel in road cuts.	Rapid seepage rate; too sandy and gravelly to hold water.	Subsoil: fair stability; good to fair compaction; low permeability when compacted; medium compressibility; good resistance to piping; moderate shrink-swell potential; fair shear strength. Underlying material: fair to poor stability; fair to good resistance to piping; good to fair shear strength.	Difficult to vegetate..	Not needed: natural drainage is adequate.	Exposed substratum difficult to vegetate.
Subject to flooding; susceptible to frost heave.	Subject to flooding; moderate to slow seepage.	Subsoil and underlying material: fair stability; fair to poor shear strength and compaction; moderate to low permeability when compacted; medium to high compressibility; fair resistance to piping.	Generally not needed; level topography.	Not needed; well-drained soils.	Not needed; level topography.
Cuts and fills are needed; difficult to vegetate road cuts.	Moderate to slow seepage.	Subsoil and underlying material: fair stability; fair to poor shear strength and compaction; moderate to low permeability when compacted; medium to high compressibility; fair resistance to piping.	Steep slopes; difficult to vegetate.	Not needed; natural drainage is adequate.	Short, steep slopes.
Generally steep topography; many cuts and fills needed; seepage is likely in deep cuts; moderate susceptibility to frost heave; moderate erodibility.	Moderate to slow seepage; features generally are favorable, but small pockets of gravelly material or bedrock occur in a few places.	Subsoil and underlying material: fair compaction and stability; low permeability when compacted; medium to high compressiblity; good resistance to piping.	Not needed; slopes greater than 12 percent.	Not needed; natural drainage is adequate.	Generally short, steep, or irregular slopes; topography generally not favorable.
Unstable when wet; high susceptiblity to frost heave; seepage in cuts; seasonal high water table.	Moderate seepage; underlain by permeable loess; seasonal high water table.	Fair to poor shear strength; fair resistance to piping; medium compressibility; moderate to low permeability when compacted; fair stability.	No major construction problems.	Seasonal high water table; permeability is slow.	No major construction problems.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—		
	Topsoil	Sand and gravel	Road fill
Made land: Ma. No interpretations; properties too variable.			
Millsdale: Md	Fair to good in surface layer. Poor to unsuitable in subsoil: sticky when wet; high water table; shallow to bedrock in places.	Not suitable: limestone bedrock can be crushed.	Poor in subsoil and underlying material: fair to poor shear strength and compaction; medium to high compressibility; moderate to high shrink-swell potential; bedrock at a depth of 20 to 40 inches.
Muren: MuA, MuB2	Good in surface layer, if not eroded. Fair to poor in subsoil: somewhat sticky when wet; low in organic-matter content.	Not suitable	Poor to fair in subsoil and underlying material: low shrink-swell potential; fair to poor shear strength; fair stability and compaction; medium to high compressibility; moderately well drained.
Negley: NeE, NeF	Good in surface layer. Poor to fair in subsoil: somewhat sticky when wet.	Fair to good in places below a depth of 8 to 10 feet.	Fair in subsoil: fair to good shear strength and compaction; medium to slight compressibility; low shrink-swell potential; fair stability. Good in underlying material: fair to good shear strength; fair to good compaction; fair stability; slight compressibility.
Parke: PaB2, PaD2	Good in surface layer. Fair in subsoil: somewhat sticky when wet.	Not suitable: deposits of sand and gravel below a depth of 8 to 10 feet in places.	Fair in subsoil: fair to poor shear strength and compaction; medium compressibility; moderate to low shrink-swell potential; fair stability. Underlying material: good to fair shear strength; fair to good compaction; fair stability.
Petrolia: Pe	Poor: sticky when wet; cloddy when dry; moderate organic-matter content; high water table; bottom-land soil.	Not suitable	Poor: medium to high compressibility; high water table; fair to poor shear strength; high susceptibility to frost heave; moderate shrink-swell potential.

properties of the soils—Continued

Soil features affecting—					
Highway location	Pond reservoir areas	Dams, dikes, levees, and embankments	Grassed waterways	Agricultural drainage	Terraces and diversions
High water table; susceptibility to frost heave; clayey material; bedrock at a depth of 20 to 40 inches.	Bedrock at a depth of 20 to 40 inches.	Subsoil and underlying material: fair stability; fair to poor shear strength and compaction; low permeability when compacted; medium to high compressibility; moderate to high shrink-swell potential; good resistance to piping; may not be feasible; bedrock at a depth of 20 to 40 inches.	Not needed; level and depressional.	High water table; slow permeability; level to depressional; may not be feasible; bedrock at a depth of 20 to 40 inches.	Not needed; level and depressional.
Some cuts and fills needed; moderately erodible; poor stability when wet; high susceptibility to frost action.	Moderate seepage; other features generally are favorable.	Fair stability and compaction; low to moderate permeability when compacted; fair resistance to piping.	No major construction problems.	Natural drainage is adequate.	No major construction problems if topography is favorable.
Steep topography; cuts and fills needed; sides difficult to vegetate and are subject to erosion.	Rapid seepage in underlying material.	Subsoil and underlying material: fair to good stability and compaction; moderate to low permeability when compacted; subject to piping; medium to slight compressibility.	Steep slopes; difficult to vegetate.	Not needed; well-drained soil.	Steep slopes; not suitable.
Cuts and fills generally needed; susceptible to frost heave; sides in cuts highly susceptible to erosion.	Rapid seepage; stratified sand and gravel in places below a depth of 8 to 10 feet.	Subsoil and underlying material: fair stability and compaction; moderate to low permeability when compacted; subject to piping.	All features favorable.	Not needed; well-drained soils.	All features favorable if topography is suitable.
Bottom land; subject to flooding; high water table; high susceptibility to frost heave; soil material is somewhat plastic.	Slow seepage; high water table; subject to flooding; has potential for dug-out ponds.	Fair stability; medium to high compressibility; fair compaction; good resistance to piping; low permeability when compacted.	Not needed; nearly level topography.	High water table; slow permeability; subject to flooding.	Not needed; on flood plains.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—		
	Topsoil	Sand and gravel	Road fill
Princeton: PrB, PrC2, PrD2, PrE2.	Good in surface layer. Fair in subsoil: somewhat sticky when wet.	Not suitable	Good in subsoil and underlying material.
Proctor: Pt	Good in surface layer. Fair in subsoil: somewhat sticky when wet.	Not suitable	Poor in subsoil: moderate shrink-swell potential; fair to poor shear strength; fair to poor compaction; fair stability; medium to high compressibility. Underlying material: fair shear strength and compaction; medium compressibility; low to moderate shrink-swell potential.
Ragsdale: Ra	Good in silt loam surface layer. Poor in subsoil; sticky when wet; high water table.	Not suitable	Fair to poor in subsoil and underlying material: fair to poor shear strength; moderate to low shrink-swell potential; susceptible to frost heave; fair stability and compaction; high water table.
Randolph: RdA	Fair in surface layer. Fair to poor in subsoil: seasonal high water table.	Not suitable	Poor in subsoil: moderate shrink-swell potential; fair to poor shear strength; fair to poor compaction; fair stability; seasonal high water table; medium to high compressibeity.

properties of the soils—Continued

Soil features affecting—					
Highway location	Pond reservoir areas	Dams, dikes, levees, and embankments	Grassed waterways	Agricultural drainage	Terraces and diversions
Cuts and fills generally needed; susceptible to frost heave; sides of cuts are unstable and difficult to vegetate.	Moderate seepage in subsoil; rapid seepage in underlying material.	Subsoil and underlying material: fair stability; fair to good compaction; moderate permeability when compacted; slight compressibilty; fair resistance to piping.	Hazard of erosion during construction.	Not needed; well-drained soils.	No limitations if topography is favorable.
Cuts and fills generally needed; susceptible to frost heave.	Moderate seepage; stratified sand and silt.	Subsoil: fair stability; fair to poor compaction; moderate shrink-swell potential; medium to high compressibility; good resistance to piping; fair to poor shear strength; low permeability when compacted. Underlying material: fair stability; fair shear strength and compaction; moderate permeability when compacted; medium compressibility; fair resistance to piping.	Hazard of erosion during construction.	Not needed; naturally well-drained soil.	No limitations if topography is favorable.
High water table; high susceptibility to frost heave; somewhat plastic subsoil; subject to ponding.	High water table; underlain by silty material; moderate seepage.	Fair stability and compaction; moderate to low permeability when compacted; medium compressibility; fair resistance to piping.	Generally not needed; nearly level topography.	High water table; slow permeability; nearly level topography.	Not needed; nearly level topography.
Seasonal high water table; susceptible to frost heave; bedrock at a depth of 20 to 40 inches.	Seasonal high water table; slow seepage; bedrock at a depth of 20 to 40 inches.	Subsoil: fair stability; fair to poor compaction; moderate shrink-swell potential; medium to high compressibility; good resistance to piping; fair to poor shear strength; bedrock at a depth of 20 to 40 inches.	Not needed; nearly level topography.	Seasonal high water table; bedrock at a depth of 20 to 40 inches; slow permeability.	Generally not needed; nearly level topography.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—		
	Topsoil	Sand and gravel	Road fill
Reesville: Re	Good in surface layer. Poor to fair in subsoil: somewhat sticky when wet; low in organic-matter content; seasonal high water table.	Not suitable	Poor in subsoil: fair to poor shear strength; fair compaction; high compressibility; fair to poor stability. Poor to fair in underlying material: fair to poor shear strength; medium compressibility; fair compaction; poor stability; seasonal high water table.
Rensselaer: Rg, Rn	Good: high water table	Not suitable	Poor to fair in subsoil and underlying material: fair shear strength and stability; fair to good compaction; medium compressibility.
Rodman: RoG	Poor or unsuitable in surface layer and subsoil: steep slopes; gravelly.	Good below a depth of 8 to 15 inches.	Very good in subsoil and underlying material: good to fair shear strength; slight compressibility; fair to good compaction; fair to poor stability.
Russell: RuB2, RuC2, RuC3, RuD2.	Good in surface layer. Fair to poor in subsoil: somewhat sticky when wet.	Not suitable	Poor in subsoil and underlying material: moderate to low shrink-swell potential; fair to poor shear strength and compaction; fair to poor stability.
Shoals: Sh	Good: underlying layers variable; subject to flooding; seasonal high water table.	Not suitable	Subsoil and underlying material: fair to poor shear strength and compaction; medium to high compressibility; low shrink-swell potential; fair stability.

properties of the soils—Continued

Soil features affecting—					
Highway location	Pond reservoir areas	Dams, dikes, levees, and embankments	Grassed waterways	Agricultural drainage	Terraces and diversions
Seasonal high water table; high susceptibility to frost heave; somewhat plastic subsoil.	Seasonal high water table; underlain by silty material; moderate seepage.	Poor to fair stability and compaction; moderate to low permeability when compacted; medium to high compressibility; fair resistance to piping.	No major construction problems.	Seasonal high water table; slow permeability.	Generally not needed; nearly level topography.
Very poorly drained; high water table; subject to ponding; susceptible to frost heave.	Moderate seepage in underlying material; high water table.	Subsoil and underlying material: fair stability; fair to good compaction; low permeability when compacted; medium compressibility; good resistance to piping.	Generally not needed; nearly level.	Very poorly drained; slow permeability in subsoil; high water table.	Generally not needed; nearly level.
Cuts and fills needed; difficult to vegetate on slopes.	Rapid seepage; steep to very steep slopes.	Subsoil and underlying material: fair to poor stability; fair to good compaction; high to moderate permeability when compacted; slight compressibility; fair to good resistance to piping; good to fair shear strength.	Steep, gravelly slopes are difficult to vegetate.	Not needed; excessively drained and very porous.	Steep and very steep slopes; hazard of erosion; shallow to sand and gravel.
Cuts and fills needed; susceptible to frost heave.	Moderate seepage	Subsoil and underlying material: fair to poor stability and compaction; low permeability when compacted; medium to high compressibility; good resistance to piping; low to moderate shrink-swell potential; fair to poor shear strength.	No limitations	Not generally needed; natural drainage is adequate.	No soil limitations; areas having short slopes are not suited.
Subject to flooding; seasonal high water table; susceptible to frost heave.	Seasonal high water table; subject to flooding; slow seepage.	Subsoil and underlying material: fair stability; fair to poor shear strength and compaction; moderate to low permeability when compacted; medium to high compressibility; fair resistance to piping.	Not needed; level topography.	Seasonal high water table; subject to flooding.	Not needed; level topography.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—		
	Topsoil	Sand and gravel	Road fill
Sloan: So	Fair to good in surface layer. Poor or fair in subsoil: variable texture; high water table.	Not suitable.	Poor in subsoil: moderate shrink-swell potential; fair shear strength; medium compressibility; good to fair compaction; fair stability. Fair to poor in underlying material: fair to poor shear strength and compaction; medium to high compressibility; low shrink-swell potential; fair stability.
Strip mines: St. No interpretations; properties too variable.			
Tippecanoe: Tp	Good in surface layer. Fair in subsoil: somewhat sticky when wet; low in organic-matter content.	Not suitable within a depth of 60 inches; sands and gravels containing fines below a depth of 60 inches.	Poor to fair in subsoil: moderate shrink-swell potential; fair shear strength; medium to high compressibility; fair to good compaction. Good in underlying material: low shrink-swell potential; fair shear strength; fair to good compaction; slight compressibility.
Vincennes: Vn	Fair in surface layer: low to moderate in organic-matter content. Poor in subsoil: somewhat sticky when wet; high water table.	Generally not suitable; some areas may be underlain by sand.	Fair to poor in subsoil and underlying material: high water table; moderate shrink-swell potential; fair stability and compaction; medium compressibility; susceptible to frost heave; fair shear strength.
Wakeland: Wa	Good: subject to flooding; seasonal high water table.	Not suitable.	Fair in subsoil and underlying material: poor stability and compaction; medium compressibility; seasonal high water table; subject to flooding; highly dispersible.

properties of the soils—Continued

Soil features affecting—					
Highway location	Pond reservoir areas	Dams, dikes, levees, and embankments	Grassed waterways	Agricultural drainage	Terraces and diversions
Subject to flooding; high water table; susceptible to frost heave.	High water table; subject to flooding; moderately slow seepage.	Subsoil: fair stability; good to fair compaction; low permeability when compacted; medium compressibility; good resistance to piping; moderate shrink-swell potential; fair shear strength. Underlying material: fair stability; fair to poor shear strength and compaction; moderate to low permeability when compacted; medium to high compressibility; fair resistance to piping.	Not needed; level topography.	High water table; subject to flooding.	Not needed; level topography; wet.
Susceptible to frost heave; moderately well drained.	Underlain by rapidly permeable material.	Subsoil: fair to good stability and compaction; low permeability when compacted; medium to high compressibility; good resistance to piping. Underlying material: fair to good stability and compaction; moderate to high permeability when compacted; slight compressibility; fair to poor resistance to piping.	Not needed; level topography.	Not needed; natural drainage is adequate.	Not needed; level topography.
High water table; subject to ponding; high susceptibility to frost heave.	Nearly level; high water table; some seepage below a depth of 4 feet.	Fair stability and compaction characteristics; moderate to low permeability when compacted; medium compressibility; fair resistance to piping.	Not needed; high water table; nearly level and depressional.	High water table; slow permeability; stratified sand, silt, and clay below 4 feet.	Not needed; level relief; high water table.
Subject to flooding; seasonal high water table; subject to frost heave; medium compressibility.	Seasonal high water table; subject to flooding; moderate seepage.	Poor stability and compaction; moderate permeability when compacted; poor resistance to piping.	Not needed; level topography.	Seasonal high water table; subject to flooding.	Not needed; level topography.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—		
	Topsoil	Sand and gravel	Road fill
Warsaw: WrA, WrB2	Good in surface layer: thick. Fair or poor in subsoil: sticky when wet; gravel throughout; underlying material droughty.	Good below a depth of 36 to 60 inches; some silt present in places.	Poor in subsoil: moderate shrink-swell potential; fair shear strength; medium compressibility; good to fair compaction; fair stability. Very good in underlying material: good to fair shear strength; slight compressibility; fair to good compaction; fair to poor stability.
Washtenaw: Ws	Good in surface layer: subject to ponding; high water table.	Not suitable	Underlying material: high water table; fair to good stability and compaction; fair shear strength.
Westland: Wt	Good to fair in surface layer: somewhat sticky when wet. Fair to poor in subsoil: plastic and sticky when wet.	Good below a depth of 40 to 80 inches; high water table.	Poor in subsoil: moderate shrink-swell potential; fair to poor shear strength; fair to poor compaction; fair stability; high water table; medium to high compressibility. Very good in underlying material: good to fair shear strength; slight compressibility; fair to good compaction; fair to poor stability.

properties of the soils—Continued

Soil features affecting—					
Highway location	Pond reservoir areas	Dams, dikes, levees, and embankments	Grassed waterways	Agricultural drainage	Terraces and diversions
Well drained; loose sand makes for easy excavation but sometimes hinders hauling; cuts and fills often needed; difficult to vegetate exposed gravel in road cuts.	Rapid seepage; too sandy and gravelly to hold water.	Subsoil: fair stability; good to fair compaction; low permeability when compacted; medium compressibility; good resistance to piping; moderate shrink-swell potential. Underlying material: fair to poor stability; fair to good compaction; high to moderate permeability when compacted; slight compressibility; fair to good resistance to piping; good to fair shear strength.	Difficult to vegetate.	Not needed; natural drainage adequate.	Underlying material difficult to vegetate when exposed.
High water table; subject to ponding; susceptible to frost heave; sticky when wet.	High water table; moderate to slow seepage.	Underlying material: fair to good stability and compaction; low permeability when compacted; medium to high compressibility; good resistance to piping; fair shear strength; high water table.	Not needed; level and depressional.	High water table; slow permeability; level to depressional.	Not needed; level and depressional.
High water table; susceptible to frost heave.	High water table; rapid seepage in underlying material.	Subsoil: fair stability; fair to poor compaction; moderate shrink-swell potential; medium to high compressibility; good resistance to piping; fair to poor shear strength. Underlying material: fair to poor stability; fair to good compaction; high to moderate permeability when compacted; slight compressibility; fair to good resistance to piping; good to fair shear strength.	Not needed; high water table; nearly level or depressional.	High water table; sand and gravel underlying material at a depth of 40 to 80 inches.	Not needed; level relief; high water table.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—		
	Topsoil	Sand and gravel	Road fill
Whitaker: Wx	Good in surface layer. Fair to poor in subsoil: sticky when wet.	Not suitable	Poor in subsoil: moderate shrink-swell potential; fair to poor shear strength; fair to poor compaction; fair stability; medium to high compressibility. Fair to poor in underlying material: fair to poor shear strength; medium compressibility; poor compaction and stability.
Xenia: XeB2	Good or fair in surface layer: medium in organic-matter content. Fair or poor in subsoil: somewhat sticky when wet.	Not suitable	Fair to poor in subsoil and underlying material: fair shear strength; medium to high compressibility; fair to good compaction and stability.
Zipp: Zp	Poor in surface layer and subsoil: high content of clay.	Not suitable	Very poor to poor in subsoil and underlying material: high shrink-swell potential; poor shear strength; fair to poor stability and compaction; high compressibility; plastic and sticky when wet.

properties of the soils—Continued

Soil features affecting—					
Highway location	Pond reservoir areas	Dams, dikes, levees, and embankments	Grassed waterways	Agricultural drainage	Terraces and diversions
Seasonal high water table; susceptible to frost heave.	Seasonal high water table; moderate permeability; moderate seepage in subsoil; moderate to rapid seepage below a depth of about 5 feet.	Subsoil: fair stability; fair to poor compaction; moderate shrink-swell potential; medium to high compressibility; good resistance to piping; fair to poor shear strength; low permeability when compacted. Underlying material: poor stability and compaction; fair to poor shear strength; medium compressibility; moderate permeability when compacted; poor resistance to piping.	Generally not needed; level topography.	Seasonal high water table; moderate permeability.	Generally not needed; level topography.
Susceptible to frost heave; moderately well drained.	Moderate to slow seepage.	Subsoil and underlying material: fair to good compaction and stability; low permeability when compacted; medium to high compressibility; good resistance to piping; moderate to low shrink-swell potential; fair shear strength.	All features favorable.	Generally not needed; moderately well drained.	All features favorable; areas having short slopes are not suited.
High water table; subject to flooding; high susceptibility to frost heave; high compressibility; high shrink-swell potential.	High water table; subject to flooding; nearly level; slow seepage.	Fair to poor stability and compaction; low permeability when compacted; high compressibility; good resistance to piping.	Not needed; level topography.	High water table; subject to flooding; very slow permeability.	Not needed; level topography.

Town and Country Planning

Residential, commercial, industrial, and institutional developments are growing rapidly in Vigo County as the suburbs of Terre Haute expand into the rural areas. The rapidity with which developments have expanded in the past has led to many problems. These problems clearly show the need for careful planning and for broad understanding of the physical and economic aspects involved when the use of land is changed.

This soil survey will help in planning these developments and in solving problems that arise as use of the land changes (fig. 18). Planning officials and developers, as well as homeowners and others, can find useful information in the soil maps, in the text, and in the tables in this survey. The detailed map at the back of this survey is useful, because it shows the location of each of the soils in the county. The colored general soil map that precedes the detailed soil map shows the pattern of the major soils within the county. All of the soils are discussed in detail in the section "Descriptions of the Soils."

The soils are evaluated for town and country planning to a depth of only 5 feet or less. Soils are rated on the basis of three classes of soil limitations. A rating of *slight* means that, for the intended use, the soil is relatively free of limitations and the facility is easily created, improved, or maintained. A *moderate* rating means that limitations need to be recognized, but that they can be overcome with good management and careful design. A *severe* rating means that limitations are severe enough to make use questionable, and extreme measures are needed to overcome the limitations.

Limitations and properties of the soils for use in town and country planning are given in table 9.

In the paragraphs that follow, each use is defined and the properties important in rating the limitations for such purposes are given. The information can be used, with information in other parts of the survey, as a guide in the use of soil for town and country planning. Before beginning any construction project, however, an investigation should be made at the site being considered.

Residential or light industrial development.—Ratings are for buildings of three stories or less. Soils are important in the construction and maintenance of building foundations and basements. The cost of excavation, the bearing strength of the foundation, and the drainage around the basement depend upon the soil. A properly constructed basement can be expected not only to support the building without undue settling and cracking but also to be dry throughout the year. Sound construction techniques provide adequate drainage around the foundation or footing to prevent undue settlement and wet basements. Soil characteristics affecting homesites or commercial sites include depth to seasonal high water table, slope, depth, depth to bedrock, hazard of flooding

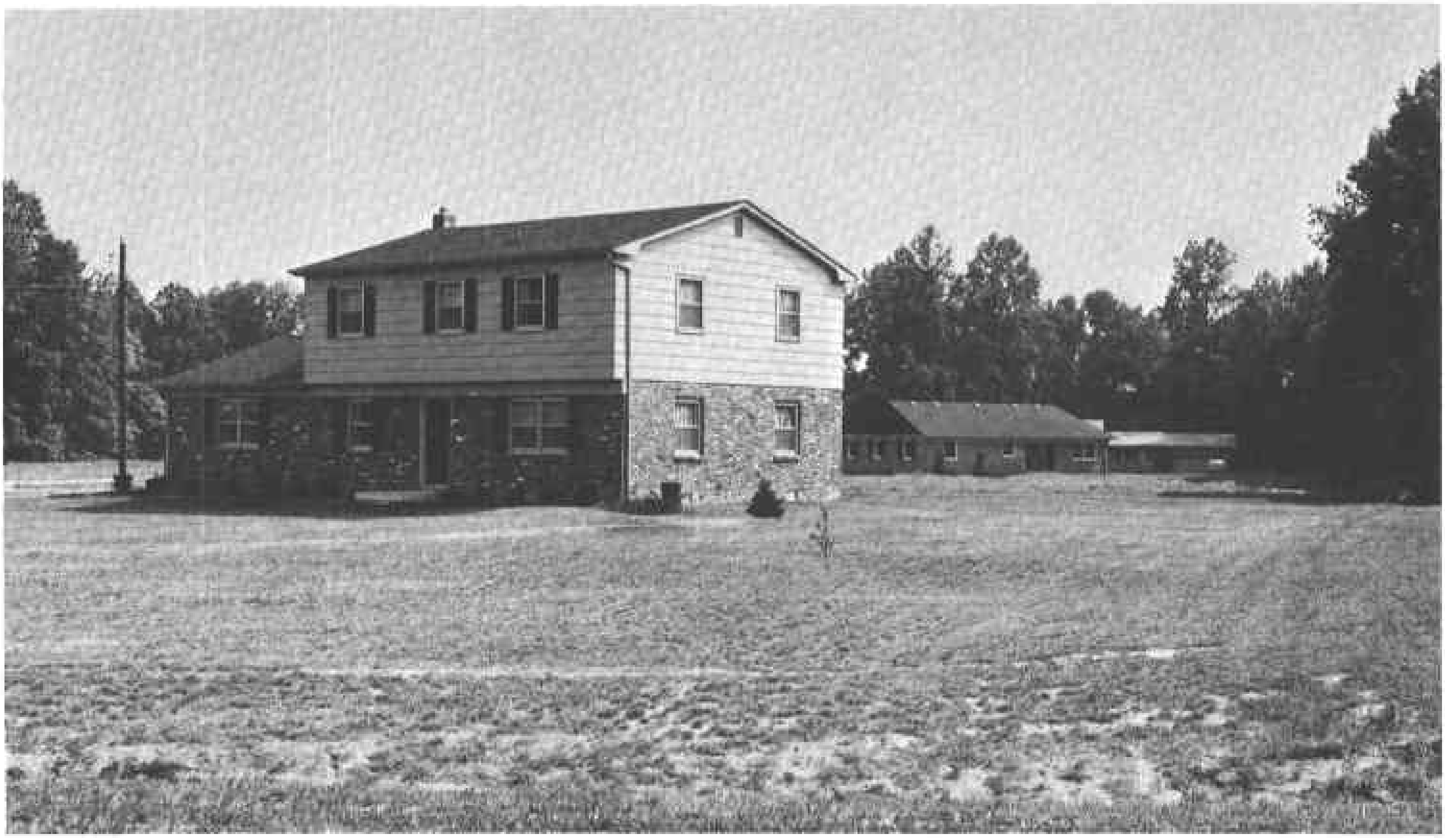


***Figure 18.*—Housing development on Alford silt loam. This is a good example of proper site selection. The soil is well drained and moderately permeable.**

or ponding, compressibility, shear strength, and shrink-swell potential. In determining the degree of limitations for residential or industrial developments, disposal of effluent from septic tanks was not considered.

Septic tank absorption fields.—Septic tanks that have an absorption field are used to dispose of sewage where a central sewage system is unavailable. A well-designed system consists of a septic tank for holding solid wastes, a distribution box for dispensing effluent, and a tile disposal field. Successful operation of the entire system depends upon the ability of the soil to absorb and filter the liquid effluent passed through the tile field. The presence of soil characteristics that impair proper absorption and filtering of the effluent causes health hazards, and the system becomes a public nuisance. Soil characteristics affecting the operation of the tile absorption field are depth to seasonal high water table, slope, depth to bedrock, hazard of flooding or ponding, and permeability.

Landscaping and lawns.—The establishment of lawns and shrubs is important in most residential areas and around many commercial locations. Some soil characteristics that are limited for landscaping and lawns may not be limiting for building purposes. Some landscaping problems can be overcome or dealt with if the soil limitations are understood. The soil characteristics affecting the establishment and maintenance of lawns and shrubs are available water capacity, droughtiness, soil erodibility, slope, hazard of flooding and ponding, and depth to seasonal high water table.

Local roads, streets, and parking lots.—These are trafficways that carry automobile traffic all year. They consist of underlying local soil material, either cut or fill, called the road subgrade; the base material of gravel, crushed rock, or lime- or cement-stabilized soil material called the surface; and the actual road surface, generally asphalt or concrete, called the pavement. The subgrade for roads, streets, and parking lots is built mainly from the soil at hand, and cuts and fills are commonly limited to less than 6 feet. Soil characteristics that affect construction include depth to seasonal high water table, slope, depth to bedrock, hazard of flooding or ponding, shrink-swell potential, and susceptibility to frost heave.

Sanitary landfills.—These are disposal areas for trash and garbage. The soils are rated for the trench method of landfill, in which the hauling of cover material is unnecessary. A good sanitary landfill should operate without contaminating the water supply, reducing the esthetic value of land, or causing a health hazard. In addition, it should be usable during all seasons of the year. Fill areas that have been adequately compacted and covered can be used for parking areas, parks, recreation areas, and other uses. Soil characteristics affecting the operation of a sanitary landfill are depth to seasonal high water table, slope, depth to bedrock, hazard of flooding or ponding, texture, and permeability. Routine soil investigations generally are confined to a depth of about 5 to 6 feet, but many landfill operations use trenches as deep as 15 feet or more. Therefore, there is a need for a geologic investigation of the area to determine the possibility of polluting the ground water as well as to determine the design of the landfill. The soil survey is a valuable tool in selecting sites and determining where additional investigations are warranted.

Sewage lagoons.—These are shallow lakes to hold sewage for the time required for bacterial decomposition. A suitable site should provide an impoundment area and enough soil material to make the dam structure. The complete lagoon must be able to hold water, have minimum seepage, and not contaminate the water supply. Soil characteristics affecting sewage lagoons are depth to seasonal high water table, slope, depth to bedrock, presence of coarse fragments, hazard of flooding or ponding, permeability, and organic-matter content.

TABLE 9.—*Limitations and properties of soils for town and country planning*

Soil series and map symbols	Estimated degree of limitations for—					
	Residential or light industrial development (disposal of septic tank effluent not considered)	Septic tank absorption fields	Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Sewage lagoons
Ade:						
AdB	Slight	Slight[1]	Moderate: droughty.	Slight for roads, moderate for parking lots: slope.	Severe: material too sandy to provide good cover; hazard of free flow of leachate to ground water.	Severe: rapid permeability; sandy material is too porous to hold water.
AdC	Moderate: moderately sloping; some excavation generally required.	Moderate: slope; rapid permeability; estimated percolation rate faster than 45 minutes per inch; possible pollution of ground water.	Moderate: droughty.	Moderate for roads, severe for parking lots: slope.	Severe: material too sandy to provide good cover; hazard of free flow of leachate to ground water.	Severe: rapid permeability; sandy material is too porous to hold water; slope.

See footnotes at end of table.

TABLE 9.—*Limitations and properties of soils for town and country planning*—Continued

Soil series and map symbols	Estimated degree of limitations for—					
	Residential or light industrial development (disposal of septic tank effluent not considered)	Septic tank absorption fields	Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Sewage lagoons
Alford:						
AlB2	Slight	Slight	Slight	Slight for roads, moderate for parking lots: slope.	Slight	Moderate: slope; moderate permeability; silty material is moderately suited to embankments.
AlC2	Moderate: moderately sloping; some excavation generally required.	Moderate: slope; moderate permeability; estimated percolation rate faster than 45 minutes per inch.	Slight	Moderate for roads, severe for parking lots: slope.	Slight	Severe: slope.
AlC3	Moderate: severely eroded; moderately sloping; some excavation generally required.	Moderate: slope; moderate permeability; estimated percolation rate faster than 45 minutes per inch.	Moderate: severely eroded.	Moderate for roads, severe for parking lots: slope.	Slight	Severe: slope.
AlD2	Severe: slope	Severe: slope	Moderate: strongly sloping hazard of erosion.	Severe: slope	Moderate: slope.	Severe: slope.
AlD3, AlE2	Severe: slope	Severe: slope	Severe: severely eroded; strongly sloping.	Severe: slope	Moderate: slope.	Severe: slope.
AlF	Severe: slope	Severe: slope	Severe: slope; severe hazard of erosion.	Severe: slope	Severe: slope	Severe: slope.
Armiesburg: Ar	Severe: subject to flooding.	Severe: subject to flooding; moderate permeability; estimated percolation rate 45 to 60 minutes per inch.	Moderate: subject to flooding; floodwater can damage landscape plantings.	Moderate: subject to flooding; moderate frost-heave potential.	Severe: subject to flooding.	Severe: subject to flooding.
Ava: AvB2	Slight	Severe: very slow permeability; estimated percolation rate slower than 60 minutes per inch.	Slight	Moderate: fair stability; subject to frost heave; some excavation needed for parking lots.	Moderate: texture moderately affects workability.	Moderate: slope; very slowly permeable fragipan at a depth of about 2½ feet.

See footnotes at end of table.

TABLE 9.—*Limitations and properties of soils for town and country planning*—Continued

Soil series and map symbols	Estimated degree of limitations for—					
	Residential or light industrial development (disposal of septic tank effluent not considered)	Septic tank absorption fields	Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Sewage lagoons
Ayrshire: Ay	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet; fair to poor shear strength; low to moderate shrink-swell potential; medium to high compressibility; subject to liquefaction and piping.	Severe: seasonal high water table at a depth of 1 to 3 feet; moderate permeability; estimated percolation rate 45 to 60 minutes per inch.	Moderate: seasonal high water table; some shrubs not suited; lawns damaged if used during wet periods.	Moderate: seasonal high water table; susceptible to frost heave.	Moderate: seasonal high water table; somewhat poorly drained.	Moderate: moderate permeability; sandy material somewhat adversely affects use for building embankments.
Bartle: Ba	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet; fair to poor shear strength; low to moderate shrink-swell potential; medium to high compressibility; fair resistance to piping.	Severe: very slow permeability; seasonal high water table at a depth of 1 to 3 feet; estimated percolation rate slower than 60 minutes per inch.	Moderate: seasonal high water table; some shrubs not suited; lawns damaged if used during wet periods.	Moderate: seasonal high water table; high susceptibility to frost heave.	Moderate: somewhat poorly drained; silty material somewhat hinders trafficability.	Moderate: permeability is very slow in fragipan but ranges in places to moderate below the fragipan; somewhat poorly drained.
Bloomfield:						
BlB	Slight	Slight: moderately rapid to rapid permeability; estimated percolation rate faster than 45 minutes per inch; possible pollution of ground water.	Moderate: droughty.	Slight for roads, moderate for parking lots: slope.	Severe: material too sandy to provide good cover; hazard of free flow of leachate to ground water.	Severe: moderately rapid to rapid permeability; material too sandy to hold water.
BlC	Moderate: moderately sloping; some excavation generally required.	Moderate: slope; moderately rapid to rapid permeability; estimated percolation rate faster than 45 minutes per inch; possible pollution of ground water.	Moderate: droughty.	Moderate for roads, severe for parking lots; slope.	Severe: material too sandy to provide good cover; hazard of free leachate flow to ground water.	Severe: moderately rapid to rapid permeability; slope.

See footnotes at end of table.

TABLE 9.—*Limitations and properties of soils for town and country planning*—Continued

Soil series and map symbols	Estimated degree of limitations for—					
	Residential or light industrial development (disposal of septic tank effluent not considered)	Septic tank absorption fields	Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Sewage lagoons
Bloomfield—Con.						
BlD	Severe: slope	Severe: slope; moderately rapid to rapid permeability; estimated percolation rate faster than 45 minutes per inch; possible pollution of ground water.	Severe: strongly sloping; droughty; hazard of erosion.	Severe: slope	Severe: material too sandy to provide good cover; hazard of free flow of leachate to ground water.	Severe: moderately rapid to rapid permeability; slope.
Borrow pits: Bp. Properties too variable for reliable estimates to be made.						
Camden:						
CaA	Slight	Slight	Slight	Slight	Severe: moderately rapid permeability at a depth of less than 5 feet.	Severe: moderately rapid permeability at a depth of less than 5 feet.
CaB	Slight	Slight	Slight	Slight for roads, moderate for parking lots: slope.	Severe: moderately rapid permeability at a depth of less than 5 feet.	Severe: moderately rapid permeability at a depth of less than 5 feet.
Cincinnati:						
CnC2	Moderate: moderately sloping; some excavation generally required; low to moderate shrink-swell potential; fair shear strength.	Severe: very slow permeability; estimated percolation rate slower than 60 minutes per inch.	Slight	Moderate for roads, severe for parking lots: slope.	Slight	Severe: slope.
CnC3	Moderate: moderately sloping; some excavation generally required; low to moderate shrink-swell potential; fair shear strength.	Severe: very slow permeability; estimated percolation rate slower than 60 minutes per inch.	Moderate: severely eroded.	Moderate for roads, severe for parking lots: slope.	Slight	Severe: slope.
CnD3	Severe: slope	Severe: slope; very slow permeability; estimated percolation rate slower than 60 minutes per inch.	Severe: severely eroded; strongly sloping.	Severe: slope	Moderate: slope.	Severe: slope.

See footnotes at end of table.

TABLE 9.—*Limitations and properties of soils for town and country planning*—Continued

Soil series and map symbols	Estimated degree of limitations for—					
	Residential or light industrial development (disposal of septic tank effluent not considered)	Septic tank absorption fields	Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Sewage lagoons
Cory: Co	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet; fair to poor shear strength; medium compressibility.	Severe: seasonal high water table at a depth of 1 to 3 feet; slow permeability; estimated percolation rate slower than 60 minutes per inch.	Moderate: seasonal high water table; some shrubs not suited; lawns damaged if used during wet periods.	Moderate: seasonal high water table; susceptible to frost heave; unstable when wet.	Moderate: seasonal high water table; somewhat poorly drained; silt loam and silty clay loam material affects trafficability.	Moderate: permeability is slow in subsoil but moderate at a depth below about 45 inches; somewhat poorly drained.
Crane: Cr	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet; fair to poor shear strength.	Severe: seasonal high water table at a depth of 1 to 3 feet; moderate permeability; estimated percolation rate 45 to 60 minutes per inch.	Moderate: seasonal high water table; some shrubs not suited; lawns damaged if used during wet periods.	Moderate: seasonal high water table; high susceptibility to frost heave.	Severe: porous stratified material below a depth of about 50 inches; hazard of free flow of leachate to ground water.	Severe: underlying material has rapid permeability; too porous to hold water.
Eel: Ee	Severe: subject to flooding.	Severe: subject to flooding; moderate permeability; estimated percolation rate faster than 45 minutes per inch.	Moderate: subject to flooding; floodwaters may damage landscape plantings.	Moderate: subject to flooding: moderate to high susceptibility to frost heave.	Severe: subject to flooding.	Severe: subject to flooding.
Elston:						
ElA	Slight	Slight [1]	Moderate: somewhat droughty.	Slight	Severe: porous sand and some gravel at a depth of less than 5 feet; hazard of free flow of leachate to ground water.	Severe: porous sand and some gravel at a depth of less than 5 feet; sandy material very rapidly permeable.
ElB	Slight	Slight [1]	Moderate: somewhat droughty.	Slight for roads, moderate for parking lots: slope.	Severe: porous sand and some gravel at a depth of less than 5 feet; hazard of free flow of leachate to ground water.	Severe: porous sand and some gravel at a depth of less than 5 feet; sandy material very rapidly permeable.
Fincastle: Fn	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet; fair to poor shear strength; medium compressibility.	Severe: seasonal high water table at a depth of 1 to 3 feet; slow permeability; estimated percolation rate slower than 60 minutes per inch.	Moderate: seasonal high water table; lawns damaged if used during wet periods.	Moderate: seasonal high water table; susceptible to frost heave; medium to high compressibility.	Moderate: seasonal high water table; somewhat poorly drained.	Moderate: somewhat poorly drained.

See footnotes at end of table.

TABLE 9.—*Limitations and properties of soils for town and country planning*—Continued

Soil series and map symbols	Estimated degree of limitations for—					
	Residential or light industrial development (disposal of septic tank effluent not considered)	Septic tank absorption fields	Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Sewage lagoons
Fox:						
FoA	Slight	Slight [1]	Moderate: somewhat droughty.	Slight	Severe: porous sand and gravel at a depth of about 2 to 4 feet; hazard of free flow of leachate to ground water.	Severe: porous sand and gravel at a depth of about 2 to 4 feet; very rapid permeability in sand and gravel.
FoB2	Slight	Slight [1]	Moderate: somewhat droughty.	Slight for roads, moderate for parking lots: slope.	Severe: porous sand and gravel at a depth of about 2 to 4 feet; hazard of free flow of leachate to ground water.	Severe: porous sand and gravel at a depth of about 2 to 4 feet; very rapid permeability in sand and gravel.
FxC3	Moderate: severely eroded; moderately sloping; some excavation usually required.	Moderate: slope; rapid permeability in underlying sand and gravel; estimated percolation rate faster than 45 minutes per inch; possible pollution of ground water.	Severe: severely eroded; shallow to sand and gravel; droughty.	Moderate for roads, severe for parking lots: slope.	Severe: porous sand and gravel at a depth of about 2 to 4 feet; hazard of free flow of leachate to ground water.	Severe: porous sand and gravel at a depth of about 2 to 4 feet; very rapid permeability in sand and gravel; slope.
Genesee: Ge, Gf.	Severe: subject to flooding.	Severe: subject to flooding; moderate permeability; estimated percolation rate faster than 45 minutes per inch.	Moderate: subject to flooding; floodwater can damage landscape plantings.	Moderate: subject to flooding; moderate to high susceptibility to frost heave; medium to high compressibility.	Severe: subject to flooding.	Severe: subject to flooding.
Gravel pits: Gp. Properties too variable for reliable estimates to be made.						
Hennepin: HeG	Severe: slope	Severe: slope	Severe: slope; severe hazard of erosion.	Severe: slope	Severe: slope	Severe: slope.
Hickory: HkE, HkF.	Severe: slope	Severe: slope	Severe: slope; severe hazard of erosion.	Severe: slope	Severe: slope	Severe: slope.

See footnotes at end of table.

TABLE 9.—*Limitations and properties of soils for town and country planning*—Continued

Soil series and map symbols	Estimated degree of limitations for—					
	Residential or light industrial development (disposal of septic tank effluent not considered)	Septic tank absorption fields	Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Sewage lagoons
Iva:						
IvA	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet; fair to poor shear strength; soft when wet; medium compressibility.	Severe: slow permeability; seasonal high water table at a depth of 1 to 3 feet; estimated percolation rate slower than 60 minutes per inch.	Moderate: seasonal high water table; some shrubs not suited; lawns damaged if used during wet periods.	Moderate: seasonal high water table; high susceptibility to frost heave; poor stability when wet.	Moderate: seasonal high water table; somewhat poorly drained; silty and clayey material hinders trafficability.	Moderate: slow permeability in subsoil, moderate permeability below a depth of about 4½ feet; somewhat poorly drained.
IvB	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet; fair to poor shear strength; soft when wet; medium compressibility.	Severe: slow permeability; seasonal high water table at a depth of 1 to 3 feet; estimated percolation rate slower than 60 minutes per inch.	Moderate: seasonal high water table; some shrubs not suited; lawns damaged if used during wet periods.	Moderate: seasonal high water table; high susceptibility to frost heave; poor stability when wet; slope hinders development of parking lots.	Moderate: seasonal high water table; somewhat poorly drained; silty and clayey material hinders trafficability.	Moderate: slope; somewhat poorly drained.
Made land: Ma. Properties too variable for reliable estimates to be made.						
Millsdale: Md	Severe: very poorly drained; subject to ponding; high water table; bedrock at a depth of 20 to 40 inches.	Severe: high water table; very poorly drained; subject to ponding; slow permeability; estimated percolation rate slower than 60 minutes per inch; bedrock at a depth of 20 to 40 inches.	Moderate: high water table; subject to ponding; very poorly drained; bedrock at a depth of 20 to 40 inches.	Severe: depressional soil; subject to ponding; high water table; high susceptibility to frost heave; very poorly drained; bedrock at a depth of 20 to 40 inches.	Severe: depressional soil; subject to ponding; very poorly drained; high water table; bedrock at a depth of 20 to 40 inches.	Severe: subject to ponding; high water table; very poorly drained; limestone bedrock at a depth of 20 to 40 inches.
Muren:						
MuA	Moderate: medium to high compressibility; fair to poor shear strength; soft when wet; low shrink-swell potential.	Severe: moderately slow permeability; estimated percolation rate slower than 60 minutes per inch.	Slight	Moderate: poor stability when wet; high susceptibility to frost heave.	Slight	Moderate: permeability is moderately slow to a depth of 4½ feet, moderate below.

See footnotes at end of table.

TABLE 9.—*Limitations and properties of soils for town and country planning*—Continued

Soil series and map symbols	Estimated degree of limitations for—					
	Residential or light industrial development (disposal of septic tank effluent not considered)	Septic tank absorption fields	Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Sewage lagoons
Muren—Con.						
MuB2	Moderate: medium to high compressibility; fair to poor shear strength; soft when wet; low shrink-swell potential.	Severe: moderately slow permeability; estimated percolation rate slower than 60 minutes per inch.	Slight	Moderate: poor stability when wet; high susceptibility to frost heave; slope hinders development of parking lots.	Slight	Moderate: slope.
Negley: NeE, NeF.	Severe: slope	Severe: slope	Severe: slope; severe hazard of erosion.	Severe: slope	Severe: slope; porous sandy material below a depth of about 4½ to 5 feet; hazard of free flow of leachate to ground water.	Severe: slope; porous sandy material below a depth of about 4½ to 5 feet; permeability more than 2 inches per hour.
Parke:						
PaB2	Slight	Slight	Slight	Slight for roads, moderate for parking lots: slope.	Severe: porous sandy material below a depth of about 4½ feet; hazard of free flow of leachate to ground water.	Severe: porous sandy material below a depth of about 4½ feet; permeability more than 2 inches per hour.
PaD2	Severe: slope	Severe: slope	Moderate: strongly sloping; hazard of erosion.	Severe: slope	Severe: porous sandy material below a depth of about 4½ feet; hazard of free flow of leachate to ground water.	Severe: slope; porous sandy material below a depth about 4½ feet; permeability more than 2 inches per hour.
Petrolia: Pe	Severe: subject to flooding; poorly drained; high water table; medium to high compressibility.	Severe: subject to flooding; poorly drained; high water table; slow permeability; estimated percolation rate slower than 60 minutes per inch.	Severe: subject to flooding: poorly drained; high water table.	Severe: subject to flooding; poorly drained; high susceptibility to frost heave.	Severe: subject to flooding; poorly drained; high water table; clayey material hinders trafficability and is subject to cracking as it dries.	Severe: subject to flooding; high water table; poorly drained.
Princeton:						
PrB	Slight	Slight	Moderate: somewhat droughty.	Slight for roads, moderate for parking lots: slope.	Severe: [2] underlying material has rapid permeability.	Severe: underlying material has rapid permeability.

See footnotes at end of table.

TABLE 9.—*Limitations and properties of soils for town and country planning*—Continued

Soil series and map symbols	Estimated degree of limitations for—					
	Residential or light industrial development (disposal of septic tank effluent not considered)	Septic tank absorption fields	Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Sewage lagoons
Princeton—Con.						
PrC2	Moderate: moderately sloping; some excavation generally required.	Moderate: slope	Moderate: somewhat droughty.	Moderate for roads, severe for parking lots: slope.	Severe:[2] underlying material has rapid permeability.	Severe: slope; underlying material has rapid permeability.
PrD2	Severe: slope	Severe: slope	Moderate: somewhat droughty; strongly sloping; hazard of erosion.	Severe: slope	Severe:[2] underlying material has rapid permeability.	Severe: slope; underlying material has rapid permeability.
PrE2	Severe: slope	Severe: slope	Severe: slope; severe hazard of erosion.	Severe: slope	Severe:[2] underlying material has rapid permeability.	Severe: slope; underlying material has rapid permeability.
Proctor: Pt	Slight	Slight	Slight	Slight	Severe: underlying material has moderately rapid permeability.	Severe: moderately rapid permeability at a depth of less than 5 feet.
Ragsdale: Ra	Severe: very poorly drained; subject to ponding; high water table; medium to high compressibility; fair to poor shear strength.	Severe: high water table; very poorly drained; subject to ponding; slow permeability; estimated percolation rate slower than 60 minutes per inch.	Severe: high water table; subject to ponding; very poorly drained.	Severe: depressional soil; subject to ponding; high water table; very poorly drained; high susceptibility to frost heave.	Severe: depressional soils; subject to ponding; high water table; very poorly drained; silty and clayey material hinders trafficability.	Severe: very poorly drained.
Randolph: RdA	Severe: seasonal high water table at a depth of 1 to 3 feet; bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table at a depth of 1 to 3 feet; slow permeability; estimated percolation rate slower than 60 minutes per inch; bedrock at a depth of 20 to 40 inches.	Moderate: seasonal high water table; some shrubs not suited; bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; subject to frost heave; medium to high compressibility; bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; somewhat poorly drained; bedrock at a depth of 20 to 40 inches.	Severe: limestone bedrock at a depth of 20 to 40 inches.
Reesville: Re	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet; fair to poor shear strength; soft when wet; medium to high compressibility; moderate to low shrink-swell potential.	Severe: slow permeability; seasonal high water table at a depth of 1 to 3 feet; estimated percolation rate slower than 60 minutes per inch.	Moderate: seasonal high water table; some shrubs not suited; lawns damaged if used during wet periods.	Moderate: seasonal high water table; high susceptibility to frost heave; soft when wet.	Moderate: seasonal high water table; somewhat poorly drained; silt loam and silty clay loam material hinders trafficability.	Moderate: somewhat poorly drained.

See footnotes at end of table.

TABLE 9.—*Limitations and properties of soils for town and country planning*—Continued

Soil series and map symbols	Estimated degree of limitations for—					
	Residential or light industrial development (disposal of septic tank effluent not considered)	Septic tank absorption fields	Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Sewage lagoons
Rensselaer: Rg, Rn.	Severe: very poorly drained; subject to ponding; high water table; fair shear strength; medium compressibility.	Severe: high water table; very poorly drained; subject to ponding; slow permeability in subsoil; estimated percolation rate slower than 60 minutes per inch.	Severe: high water table; subject to ponding; very poorly drained.	Severe: depressional soils; subject to ponding; high water table; high susceptibility to frost heave; very poorly drained.	Severe: depressional soils; subject to ponding; high water table; very poorly drained.	Severe: porous material at a depth of less than 5½ feet; permeability more than 2 inches per hour.
Rodman: RoG	Severe: slope	Severe: slope	Severe: slope; severe hazard of erosion; droughty.	Severe: slope	Severe: slope; porous sand and gravelly material not good cover; hazard of free flow of leachate to ground water.	Severe: steep slopes; very rapid permeability; sand and gravel at a depth of 8 to 15 inches.
Russell:						
RuB2	Slight	Moderate: moderate permeability; estimated percolation rate 45 to 60 minutes per inch.	Slight	Slight for roads, moderate for parking lots: slope.	Slight	Moderate: slope; moderate permeability.
RuC2	Moderate: moderately sloping; some excavation generally required.	Moderate: slope; moderate permeability; estimated percolation rate 45 to 60 minutes per inch.	Slight	Moderate for roads, severe for parking lots: slope.	Slight	Severe: slope.
RuC3	Moderate: severely eroded; moderately sloping; some excavation generally required.	Moderate: slope; moderate permeability; estimated percolation rate 45 to 60 minutes per inch.	Moderate: severely eroded.	Moderate for roads, severe for parking lots: slope.	Slight	Severe: slope.
RuD2	Severe: slope	Severe: slope	Moderate: strongly sloping; hazard of erosion.	Severe: slope	Moderate: slope.	Severe: slope.
Shoals: Sh	Severe: subject to flooding; somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet; fair to poor shear strength; medium to high compressibility.	Severe: subject to flooding; somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet; moderate permeability; estimated percolation rate faster than 45 minutes per inch.	Severe: subject to flooding; seasonal high water table; somewhat poorly drained.	Severe: subject to flooding; somewhat poorly drained; seasonal high water table; high susceptibility to frost heave.	Severe: subject to flooding; seasonal high water table; somewhat poorly drained.	Severe: subject to flooding.

See footnotes at end of table.

TABLE 9.—*Limitations and properties of soils for town and country planning*—Continued

Soil series and map symbols	Estimated degree of limitations for—					
	Residential or light industrial development (disposal of septic tank effluent not considered)	Septic tank absorption fields	Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Sewage lagoons
Sloan: So	Severe: subject to flooding; very poorly drained; high water table.	Severe: very poorly drained; subject to flooding; high water table; moderate permeability; estimated percolation rate 45 to 60 minutes per inch.	Severe: subject to flooding; very poorly drained; high water table.	Severe: subject to flooding; very poorly drained; high water table; high susceptibility to frost heave.	Severe: subject to flooding; very poorly drained; high water table.	Severe: subject to flooding; high water table; very poorly drained.
Strip mines: St. Properties too variable for reliable estimates to be made.						
Tippecanoe: Tp	Slight	Slight [1]	Slight	Slight	Severe: porous material at a depth of about 4½ feet; hazard of free flow of leachate to ground water.	Severe: underlying material has permeability of more than 2 inches per hour.
Vincennes: Vn	Severe: subject to ponding; poorly drained; high water table; fair shear strength; medium compressibility; moderate shrink-swell potential.	Severe: subject to ponding; poorly drained; high water table; slow permeability in the subsoil; estimated percolation rate slower than 60 minutes per inch.	Severe: subject to ponding; high water table; poorly drained.	Severe: subject to ponding; high water table; poorly drained; high susceptibility to frost heave.	Severe: subject to ponding; high water table; poorly drained.	Severe: porous material at a depth of less than 5 feet; permeability more than 2 inches per hour.
Wakeland: Wa	Severe: subject to flooding; seasonal high water table at a depth of 1 to 3 feet; somewhat poorly drained; fair to poor shear strength; medium compressibility.	Severe: subject to flooding; seasonal high water table at a depth of 1 to 3 feet; moderate permeability; estimated percolation rate faster than 45 minutes per inch.	Severe: subject to flooding; seasonal high water table; floodwater may damage landscape plantings.	Severe: subject to flooding; seasonal high water table; high susceptibility to frost heave; medium compressibility.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding.
Warsaw: WrA	Slight	Slight [1]	Moderate: somewhat droughty.	Slight	Severe: porous sand and gravel at a depth of about 3 to 4 feet; hazard of free flow of leachate to ground water.	Severe: underlying material is rapidly permeable.

See footnotes at end of table.

TABLE 9.—*Limitations and properties of soils for town and country planning*—Continued

Soil series and map symbols	Estimated degree of limitations for—					
	Residential or light industrial development (disposal of septic tank effluent not considered)	Septic tank absorption fields	Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Sewage lagoons
Warsaw—Con. WrB2	Slight	Slight [1]	Moderate: somewhat droughty.	Slight for roads, moderate for streets and parking lots.	Severe: porous sand and gravel at a depth of about 3 to 4 feet; hazard of free flow of leachate to ground water.	Severe: underlying material is rapidly permeable.
Washtenaw: Ws	Severe: subject to ponding; high water table; very poorly drained; medium to high compressibility; fair shear strength.	Severe: subject to ponding; high water table; very poorly drained; slow permeability; estimated percolation rate slower than 60 minutes per inch.	Severe: subject to ponding; high water table; very poorly drained.	Severe: subject to ponding; high water table; very poorly drained; high frost-heave potential.	Severe: subject to ponding; depressional soil; high water table; very poorly drained.	Severe: very poorly drained.
Westland: Wt	Severe: very poorly drained; subject to ponding; high water table; subsoil has fair to poor shear strength and underlying material has good to fair shear strength.	Severe: very poorly drained; subject to ponding; high water table; slow permeability; estimated percolation rate of subsoil slower than 60 minutes per inch.	Severe: high water table; subject to ponding; very poorly drained.	Severe: depressional soils; subject to ponding; high water table; very poorly drained; high frost-heave potential.	Severe: depressional soils; subject to ponding; high water table; very poorly drained; underlain by porous sand and gravel; hazard of free flow of leachate to ground water.	Severe: porous sand and gravel at a depth of about 3½ to 6½ feet; rapidly permeable sand and gravel.
Whitaker: Wx	Moderate: somewhat poorly drained; seasonal high water table at a depth of 1 to 3 feet; fair to poor shear strength; medium to high compressibility in subsoil and medium compressibility in underlying material.	Severe: seasonal high water table at a depth of 1 to 3 feet; moderate permeability; estimated percolation rate 45 to 60 minutes per inch.	Moderate: seasonal high water table; some shrubs not suited; lawns damaged if used during wet periods.	Moderate: seasonal high water table; susceptible to frost heave.	Severe: stratified silty and sandy material at a depth of less than 5 feet; hazard of free flow of leachate to ground water.	Severe: stratified material at a depth of less than 5 feet; rapid seepage in places.
Xenia: XeB2	Moderate: medium to high compressibility; fair shear strength; soft when wet.	Severe: moderately slow permeability; estimated percolation rate slower than 60 minutes per inch.	Slight	Moderate: poor stability when wet; moderate to high susceptibility to frost heave; grading needed for parking lots.	Moderate: texture moderately affects workability.	Moderate: slope.

See footnotes at end of table.

TABLE 9.—*Limitations and properties of soils for town and country planning*—Continued

Soil series and map symbols	Estimated degree of limitations for—					
	Residential or light industrial development (disposal of septic tank effluent not considered)	Septic tank absorption fields	Landscaping and lawns	Local roads, streets, and parking lots	Sanitary landfills	Sewage lagoons
Zipp: Zp	Severe: subject to ponding and flooding; very poorly drained; high water table; sticky when wet; high compressibility; high shrink-swell potential; poor shear strength.	Severe: very poorly drained; subject to ponding and flooding; high water table; very slow permeability; estimated percolation rate slower than 60 minutes per inch.	Severe: subject to ponding and flooding; very poorly drained; high water table.	Severe: subject to ponding and flooding; very poorly drained; high water table; high frost-heave potential; high shrink-swell potential.	Severe: subject to ponding and flooding; very poorly drained; high water table; sticky when wet.	Severe: subject to ponding and flooding; high water table; very poorly drained.

---

[1] Possible risk of polluting ground water because percolation rate is more than 45 minutes per inch.

[2] Where Princeton soils are underlain by till, the limitation for sanitary landfills is only slight.

Formation and Classification of the Soils

This section consists of three main parts. The first part tells how the factors of soil formation have affected the development of soils in Vigo County. The second explains the processes of soil formation. The third discusses the system of soil classification currently used and places each soil series in some of the categories of that system.

Factors of Soil Formation

Soil is produced by soil-forming processes acting on material deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life, mainly plant life, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil profile. It may be much or little, but some time is always required for differentiation of soil horizons. Generally, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

Parent material

The parent material in which the soils of Vigo County formed consists of till of Illinoian and Wisconsin age, loess and windblown sands of Wisconsin age, outwash of Wisconsin and Illinoian age, lacustrine material of Wisconsin age, and a few areas of residuum from limestone bedrock that is covered by a thin layer of glacial drift.

Vigo County was affected by the last three ice ages—the Kansan, the Illinoian, and the Wisconsin. The Kansan and Illinoian ice sheets covered all of the county, but the Wisconsin ice sheet covered only about 50 square miles of the northwestern part. The Kansan drift, however, is covered so deeply by the Illinoian drift that it has had little effect on the present soils of the county. The combined deposits of these glaciers make up virtually all the surface features of Vigo County.

As the ice receded from the uplands, a mantle of mixed stones, sand, silt, and clay known as glacial till was left over the bedrock. An example of a soil that formed in this material is the Hickory. The melting ice produced a large volume of water that carried large amounts of sand and gravel. Sand and gravel were deposited in stratified layers known as glacial outwash. An example of a soil that formed in this material is the Warsaw. Till and outwash are known collectively as glacial drift.

Till on the ridges and slopes ranges from 6 to 20 feet or more in depth. In the valleys the till may be 50 feet or more in depth.

A large outwash area, derived from the meltwater of the Wisconsin glaciation, parallels the Wabash River. The larger part of this terrace system is on the eastern side of the river. These sandy and gravelly deposits range from 35 feet to more than 110 feet in thickness. Elston and Warsaw are examples of soils that formed in these outwash materials.

After the last glaciation, the present flood plain of the Wabash river was formed as the river meandered from one side of its valley to the other. Genesee and Armiesburg are examples of soils that formed in the recent alluvium deposited on the flood plains.

In a few areas, mainly where there are breaks between the bottom lands and terraces, limestone bedrock is within a depth of 20 to 40 inches. The soils in these areas formed in thin deposits of loess or glacial drift and in residuum from limestone bedrock. Randolph and Millsdale are the only soils in the county that formed in these materials.

During the Wisconsin glacial period, loess was deposited over the entire upland area of the county. This mantle of loess ranges from a few inches to 10 feet or more in thickness and contributed much toward the formation of the soils in the county. Most of the silt was washed away in the steeper areas. It remained in nearly level to moderately sloping areas, however, and is the material in which many of the present soils formed. Examples of soils that formed in more than 5 feet of loess are the Alford and Muren soils. In the upland areas that were covered by till of Illinoian age, but not by Wisconsin till, many buried profiles have been identified below the point of contact between the mantle of silt and the drift.

Coarse-textured sandy material was carried by the wind and deposited as dunes on the uplands adjacent to the eastern side of the Wabash River valley. This material was blown up out of the outwash area associated with the meltwater deposits of the Wisconsin glacial age. These deposits range from a few feet to 15 feet or more in thickness. Princeton and Bloomfield soils formed in this material.

After the Wisconsin ice sheet receded from the northwestern part of the county, the area was covered by loess. Most of the soils in this area formed in both the loess and the underlying glacial material. Russell and Xenia soils are examples of soils that formed in this material.

Climate

The climate of Vigo County is midcontinental. Temperatures generally are high from June through September, and the average maximum temperature is 86° F. in July. The average daily minimum temperature is 17° in January.

Rainfall is moderately heavy, and it averages about 37 inches annually. It is well distributed throughout the year, but it is slightly greater in spring and summer than in fall and winter. The large amount of rainfall has leached plant nutrients from the surface layer of the soils and has kept free calcium carbonate from accumulating.

The climate is so nearly uniform throughout the county that differences among the soils cannot be explained on the basis of differences in climate alone. Climatic forces act upon rocks to form the parent materials in which soils are formed, but many of the more important soil characteristics would not have developed except for the activity of plant and animal life. Without the changes brought about by plants and animals, the soils would consist merely of residual or transported material derived from weathered rock, though some might have definite layers formed by leaching, by differential weathering, or by additions of alluvial or colluvial material.

Climate, acting alone on the parent material, would be largely destructive. It would cause the soluble material to be washed out of the soils. When combined with the activities of plants and animals, however, the processes of climate become constructive. A reversible cycle is established between intake and outgo of plant nutrients. Plants draw nutrients from the lower part of the soil, and when the plants die, the nutrients are returned to the upper part of the soil. In this county the climate is such that more nutrients are leached than are returned to the upper part of the soil. For this reason, many of the soils are strongly weathered, leached, acid, and low in fertility.

Plant and animal life

Before this county was settled, the native vegetation was most important in the complex of living organisms that affect soil formation. Plants, micro-organisms, earthworms, and other forms of life that live on and in the soil contribute to its morphology. Bacteria and fungi are micro-organisms that affect the soils. They cause raw plant waste to decompose into organic matter and to be incorporated into the soil. The higher forms of plants return organic matter to the soil and bring plant nutrients from the lower part of the soil to the upper part.

At one time, hardwood trees covered about 75 percent of Vigo County. The common trees were tulip-poplar, oak, hickory, elm, maple, and ash. A comparatively small amount of organic matter derived from the forest became incorporated in the soils while they were forming. In virgin forests on uplands, thin layers of forest litter and leaf mold cover the soil. A small amount of organic matter derived from decayed leaves and twigs is mixed throughout the upper 1 or 2 inches of the surface layer. Examples of soils that formed mainly under hardwood trees are the Cincinnati and Iva.

In a comparative large area that parallels the Wabash River, the native vegetation consisted of prairie grasses. This area is the terrace that lies mainly east of the bottom lands of the Wabash River. A large amount of organic matter from these grasses was incorporated in the surface layer. Examples of soils that formed under grass vegetation are the Elston and Warsaw. In areas of Ragsdale and Rensselaer soils, the native vegetation included swamp grasses and sedges as well as water-tolerant trees. These soils were covered by water much of the time, and as the organic material fell into the water, it decayed slowly and some of it accumulated.

Relief

The relief of Vigo County ranges from nearly level on bottom lands, terraces, and upland flats to very steep on upland terrace breaks. Most of the county has been dissected by erosion and streams. The lowest elevation in Vigo County, 440 feet above sea level, is in the southwestern corner of the county, and the highest elevation is Yaw Hill, 670 feet above sea level, about 1 mile northwest of Blackhawk.

The variations in relief have effected drainage and formation of the soils in the county. The influence of relief upon soil formation comes from its controlling effect upon drainage, runoff, and other water effects, including normal and accelerated erosion.

Differences in relief have radically affected moisture and air relationships within the soil. Profiles of soils developed in the same type of parent material in steep areas are less strongly developed than those in nearly level to sloping areas. This difference in soil formation is caused by (1) rapid erosion, (2) low rate of water percolation through the soil material, and (3) inadequate water in the soil for the vigorous growth of plants that influence soil formation. The degree of profile development within a given time, on a given parent material, and under the same type of vegetation depends largely on the amount of water that passes through the soil material.

Because of the variations in relief in this county, several different soils have formed in the same kind of parent material. A good example of the way relief has affected the soils that formed in the same kind of parent material is the Alford catena of soils that formed in deep loess. The Iva soils are nearly level and are somewhat poorly drained. They are gray, are mottled, and have slow permeability. The Alford soils are gently sloping to very steep, are well drained, are brown, and have moderate permeability.

Time

Generally, the longer the parent material has remained in place, the more fully developed the soil profile is. Because of differences in parent material, relief, and climate some soils mature more slowly than others. For example, soils that formed in alluvium, such as the Genesee and Wakeland, are immature because the parent materials are young and new materials are deposited periodically. Such steep soils as the Hennepin also are likely to be immature, because geologic erosion removes the soil material as fast as it accumulates. Runoff is greater on steep soils, and less water percolates down through the soil material. A mature soil is one that has well-developed A and B horizons that were produced by the natural processes of soil formation. A young soil has little or no horizon differentiation.

The soils that formed in glacial till material of Illinoian age, such as the Cincinnati and Hickory, have well-developed profiles and are considered to be mature or nearly so.

In the northwestern corner of the county, soils of the Russell and Xenia series are examples of soils that formed in glacial till and loess of Wisconsin age. These soils are less thoroughly or deeply leached than those that formed in Illinoian drift. Also, the soils on terraces, such as the Camden, Elston, Rensselaer, and Whitaker soils, formed in deposits of Wisconsin-age drift and are less thoroughly leached than those that formed in Illinoian drift.

The young soils, such as the Genesee and Eel, are on bottom lands where new materials are deposited periodically. Sandy windblown material, generally on uplands adjacent to the Wabash River, was deposited during or after the time of the Wisconsin glacial period. Soils, such as the Princeton and Bloomfield, that formed in this material are less thoroughly or deeply leached than those that formed in Illinoian drift and have an immature profile.

Processes of Soil Formation

Most of the soils in Vigo County have moderate to distinct horizons, but a few have faint horizons. The differentiation of the horizons in the soils of the county is the result of one or more of the soil-forming processes: (1) accumulation of organic matter, (2) leaching of carbonates and salts that are more soluble than calcium carbonates, (3) translocation of silicate clay minerals, and (4) reduction and transfer of iron.

Some organic matter has accumulated in the surface layer of all the soils in Vigo County. The quantities are small in some soils but fairly large in others. Soils such as Ava silt loam have a surface layer that is low to moderate in organic-matter content, but Ragsdale silt loam has a thick, dark-colored surface layer that has a high accumulation of organic matter.

Leaching of carbonates and salts has occurred in all soils of the county. The effect has been indirect. The leaching permitted subsequent translocation of silicate clay minerals in some soils. Carbonates and salts have been carried completely out of most of the well-drained soils. Even in the wettest soils, some leaching is indicated by the absence of carbonates and acid reactions. Leaching in wet soils is slow because the seasonal high water table retards movement of water through the soil. Leaching has made little progress in soils that formed in recent sediment. These soils include the alluvial soils along the Wabash River.

Translocation of silicate clay minerals has contributed to the formation of most of the soils in Vigo County. The Alford, Cincinnati, and Princeton are examples of soils that developed primarily by this soil-forming process. The dark coatings on ped faces and the clay films in former root channels in the B horizon of these soils indicate downward movement of silicate clay minerals from the A horizon. Leaching of carbonates and salts from the upper part of the profile seems to be a necessary prelude to the movement of silicate clays.

The reduction and transfer of iron has occurred in all of the very poorly drained, poorly drained, and somewhat poorly drained soils. It has also occurred to some extent in the deeper horizons of the moderately well drained soils, such as Ava silt loam. In the naturally wet soils, such as the Ragsdale and Zipp, the reduction and transfer of iron, a process often called gleying, has been important in horizon differentiation. The gray colors of the deeper horizons of the wet soils indicate the reduction or removal of iron oxides. This reduction is commonly accompanied by some transfer of iron, which may be local or general in character. After it has been reduced, iron may be removed completely from some horizons and deposited in the lower horizons, or it may move completely out of the profile. Iron has been segregated within the deeper horizons of many of the soils to form yellowish-red, strong-brown, or yellowish-brown mottles or concretions.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us understand their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Thus, in classification, soils are placed in narrow classes that are used in detailed soil surveys so that knowledge about the soils can be organized and used in managing farms, fields, and woodland; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

The classification system currently used was adopted for general use by the National Cooperative Soil Survey in 1965 (*5*). The current system is under continual study. Therefore, readers interested in developments of the current system should search the latest literature available (*3*). In table 10, the soil series of Vigo County are placed in some categories of the current system.

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measureable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped together. Most of the classes of the current system are briefly defined in the following paragraphs.

ORDER: Ten soil orders are recognized. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Three exceptions, the Entisols, Inceptisols, and Histosols, occur in many different kinds of climate. The four soil orders recognized

TABLE 10.—*Classification of soil series*

Series	Family	Subgroup	Order
Ade	Coarse-loamy, mixed, mesic	Psammentic Argiudolls	Mollisols.
Alford	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Armiesburg	Fine-silty, mixed, mesic	Fluventic Hapludolls	Mollisols.
Ava	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols.
Ayrshire	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Bartle	Fine-silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Bloomfield	Coarse-loamy, mixed, mesic	Psammentic Hapludalfs	Alfisols.
Camden	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Cincinnati	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols.
Cory	Fine-silty, mixed, mesic	Mollic Ochraqualfs	Alfisols.
Crane	Fine-loamy, mixed, mesic	Aquic Argiudolls	Mollisols.
Eel	Fine-loamy, mixed, mesic	Fluvaquentic Eutrochrepts	Inceptisols.
Elston	Coarse-loamy, mixed, mesic	Typic Argiudolls	Mollisols.
Fincastle	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Fox	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Hapludalfs	Alfisols.
Genesee	Fine-loamy, mixed, mesic	Fluventic Eutrochrepts	Inceptisols.
Genesee, sandy variant	Coarse-loamy, mixed, mesic	Fluventic Eutrochrepts	Inceptisols.
Hennepin	Fine-loamy, mixed, mesic	Typic Eutrochrepts	Inceptisols.
Hickory	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Iva	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Millsdale	Fine, mixed, mesic	Typic Argiaquolls	Mollisols.
Muren	Fine-silty, mixed, mesic	Aquic Hapludalfs	Alfisols.
Negley	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Parke	Fine-silty, mixed, mesic	Ultic Hapludalfs	Alfisols.
Petrolia	Fine-silty, mixed, nonacid, mesic	Typic Fluvaquents	Entisols.
Princeton	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Proctor	Fine-silty, mixed, mesic	Typic Argiudolls	Mollisols.
Ragsdale	Fine-silty, mixed, mesic	Typic Argiaquolls	Mollisols.
Randolph	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Reesville	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Rensselaer	Fine-loamy, mixed, mesic	Typic Argiaquolls	Mollisols.
Rodman	Sandy-skeletal, mixed, mesic	Typic Hapludolls	Mollisols.
Russell	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Shoals	Fine-loamy, mixed, nonacid, mesic	Aeric Fluvaquents	Entisols.
Sloan	Fine-loamy, mixed, mesic	Fluvaquentic Haplaquolls	Mollisols.
Tippecanoe	Fine-loamy, mixed, mesic	Typic Argiudolls	Mollisols.
Vincennes	Fine-loamy, mixed, acid, mesic	Typic Haplaquepts	Inceptisols.
Wakeland	Coarse-silty, mixed, nonacid, mesic	Aeric Fluvaquents	Entisols.
Warsaw	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Argiudolls	Mollisols.
Washtenaw	Fine-loamy, mixed, nonacid, mesic	Typic Haplaquents	Entisols.
Westland	Fine-loamy, mixed, mesic	Typic Argiaquolls	Mollisols.
Whitaker	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Xenia	Fine-silty, mixed, mesic	Aquic Hapludalfs	Alfisols.
Zipp	Fine, mixed, nonacid, mesic	Typic Haplaquepts	Inceptisols.

in Vigo County are Entisols, Inceptisols, Mollisols, and Alfisols.

Entisols are light-colored soils that do not have natural genetic horizons or that have only weakly expressed beginnings of such horizons. These soils do not have characteristics that reflect soil mixing caused by shrinking and swelling.

Inceptisols are soils that have one or more of the diagnostic horizons that are thought to form rather quickly. They are most often on young but not recent land surfaces.

Mollisols formed under grass and have a thick, dark-colored surface horizon containing colloids dominated by bivalent cations. The soil material in these soils has not been mixed by shrinking and swelling.

Alfisols are mineral soils that contain horizons of clay accumulation. Unlike the Mollisols, they lack a thick, dark-colored surface layer that contains colloids dominated by bivalent cations, but the base status of the lower horizons is not extremely low.

SUBORDER: Each order has been subdivided into suborders, primarily on the basis of the characteristics that seemed to produce classes that have the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging or soil differences resulting from the climate or vegetation.

GREAT GROUP: Suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated or those that contain a pan that interferes with the growth of roots or movement of water. The features used are the self-mulching properties of clays, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like. The great group is not shown separately in table 10, because it is the last word in the name of the subgroup.

SUBGROUP: Great groups are subdivided into subgroups, one representing the central (typic) segment of the group, and others, called intergrades, that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the great group.

FAMILY: Families are separated within subgroups primarily on the basis of properties important to the growth of plants or behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

General Nature of the County

This section discusses the history of Vigo County; the water supply; relief and drainage; climate; industries, transportation, and markets; and farming.

History

The Treaty of Fort Wayne, signed on June 7, 1803, opened to settlement the part of the Northwest Territory that is now Vigo County. Vigo County was established by an act of the State Legislature dated January 21, 1818. Formerly, it had been a part of Sullivan County (*2*).

The county was named in honor of Colonel Francis Vigo. The first settlement, Fort Harrison, was built in 1811 by General William Henry Harrison. Settlers first moved into the area that is now Harrison Township in about 1816.

The Wabash River flows southward through the central part of Vigo County. This river had an important influence on the early history of the county, because it was one of the main means of transportation.

Water Supply

Water wells in Vigo County mainly are drilled wells, but a few dug wells are still in use. Wells on uplands range from 30 to 470 feet in depth, but the average depth is about 155 feet (*8*). Generally, these wells produce from less than 1 gallon to about 60 gallons of water per minute, but some of them are dry.

In areas where the supply of water from wells is low, water from lakes and ponds also is used, and many farm ponds have been constructed to meet the need for water. In strip mining areas, housing developments are utilizing water from lakes that formed in excavations.

The soils on bottom lands and terraces along the Wabash River are underlain by sand and gravel formations, and the wells in these areas produce 3 to 2,700 gallons of water per minute. These wells range from 35 to 175 feet in depth, but the average depth is 80 feet. The sand and gravel formations that underlie soils in some parts of the county are an important source of water for domestic and industrial uses and, in some places, for irrigation. Most of the water used by Terre Haute and the surrounding communities is from deep wells and the Wabash River.

The quality of water from drilled wells varies greatly. In some areas the content of iron, chloride, or sulfate exceeds the U.S. Public Health Service (1946) standards for drinking water.

Relief and Drainage

Vigo County is almost entirely within the Wabash Lowland physiographic region, which is bordered on the northwestern corner of the county by the Tipton Till Plain. The soils in the county were derived mostly from glacial outwash material, loess, and eolian sand. A small area in the south-central part of the county, adjacent to the Wabash River, consists of a soil that formed in loess and limestone residuum. The county is characterized by the broad, flat valley and terrace and by the broad, flat uplands that are dissected by steep to very steep drainageways.

The elevation of the county ranges from 670 feet in the southeastern part to 440 feet in the southwestern corner of the county. The average elevation is 550 feet.

The county is drained by the Wabash River and by small streams throughout the county. Honey, Lost, Sugar, and Clear Creeks drain the central part. Otter, Raccoon, Spring, Brouilletts, Salt, and Coal Creeks drain the northern part. Hawk, Prairie, Turman, Busseron, and Splunge Creeks, Hayworth Slough, and Greenfield Bayou drain the southern part.

A watershed protection program has been in effect on Busseron and Prairie Creeks, and preliminary studies have been started for a similar program on Otter Creek.

Climate[4]

The climate in Vigo County is influenced by interchanges of polar and tropical airmasses. Pleasant cloudless days are interspersed with some rainy days throughout the year. Rains are not heavy, but they generally are adequate during the growing season for all the common crops in the county. A month of below-average rainfall in summer, however, can affect lawns, pastures, and crops.

Table 11 gives data on temperature and precipitation, and table 12 gives the probable dates for the last freeze in spring and the first freeze in fall.

The passing of fronts and centers of low and high air pressure change the weather every few days. Generally, high pressure brings lower temperatures, lower humidity, and sunny days, and low pressure brings higher temperatures, stronger southerly winds, higher humidity, and rain. Changes in the weather are more frequent in spring than late in summer and early in fall.

Although precipitation is rather evenly distributed throughout the year, it is greater in spring and early in summer than in winter. Rainfall in spring assures nearly maximum moisture in the soil during the period when moisture losses by evaporation exceed the moisture received through rainfall. Droughts have never been severe.

About four times in every 100 years, as much as 2.4 inches of rain can be expected to fall in 1 hour, 4.0 inches in 6 hours, and 4.6 inches in 12 hours; about 10 times in every 100 years as much as 2.1 inches of rain can be expected to fall in 1 hour, 3.3 inches in 6 hours, and 3.8 inches in 12 hours; and about 20 times in every 100 years as much as 1.7 inches of rain can be expected to fall in 1 hour, 2.8 inches in 6 hours, and 3.2 inches in 12 hours.

The amount of snowfall varies greatly from winter to winter. An occasional snow or ice storm may hamper travel, but the snow blanket often protects winter grain from the very cold air that invariably follows these storms.

On sunny days the percent of relative humidity ranges from the 90's near sunrise to the 40's in the afternoon. The relative humidity drops as the temperature rises and rises as the temperature drops. Cold fronts lower the relative humidity.

Winds usually are southwesterly, but they are northwesterly for 1 or 2 months in winter. Damaging winds have three sources. In the order of diminishing area covered but increasing intensity of the wind, these sources are low-pressure centers, thunderstorms, and tornadoes. Only 12 tornadoes have been reported since 1916, and very few were of sufficient size to injure people or damage property. Thunderstorms occur on about 48 days of the year. Most of these occur in spring or early in summer. Thunderstorms are seldom so severe as to cause loss of life or damage to property or crops.

---

[4] By LAWRENCE A. SCHAAL, climatologist for Indiana, National Weather Service, U.S. Department of Commerce.

TABLE 11.—*Temperature and precipitation*

[Most data from location 8 miles south of Terre Haute for period 1955–70, but data from Terre Haute for 73 years were added for the 1 year in 10 probabilities of precipitation]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Average monthly maximum	Average monthly minimum	Average monthly total	One year in 10 will have—		Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover of 1 inch or more
						Less than—	More than—		
	°F.	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Number*	*Inches*
January	35	17	61	−6	2.1	0.9	5.4	9	3
February	39	21	62	1	1.8	.9	5.0	4	2
March	49	30	73	12	2.8	1.1	6.5	3	4
April	64	43	82	27	4.2	1.7	6.3	(1)	2
May	74	52	88	35	4.5	1.4	8.1	0	0
June	83	61	94	46	3.8	1.4	7.5	0	0
July	86	64	96	52	4.6	1.1	6.7	0	0
August	85	62	95	50	2.6	1.2	5.5	0	0
September	81	55	92	39	3.1	1.2	6.8	0	0
October	68	44	84	27	2.1	.6	5.4	0	0
November	52	33	72	15	3.2	1.3	5.2	1	2
December	40	23	63	4	2.5	1.1	4.4	3	3
Year	63	42	[2] 98	[3] −9	37.3	31.7	48.1	20	3

[1] Less than one-half day.

[2] Average annual highest temperature.

[3] Average annual lowest temperature.

TABLE 12.—*Probabilities of last freezing temperatures in spring and first in fall, Vigo County, Ind.*

[All data from Terre Haute; length of record, 73 years]

Probability	Dates for given probability and temperature				
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
1 year in 10 later than	March 29	March 31	April 6	April 27	May 19
2 years in 10 later than	March 27	March 28	March 31	April 17	May 8
5 years in 10 later than	March 11	March 16	March 24	April 7	April 22
Fall:					
1 year in 10 earlier than	November 19	November 14	October 27	October 15	October 3
2 years in 10 earlier than	November 22	November 18	November 3	October 23	October 6
5 years in 10 earlier than	December 2	November 29	November 8	October 31	October 17

Industries, Transportation, and Markets

In addition to farming and mining, there are other important industries in Vigo County. Terre Haute, the county seat, is a highly industrialized city, and manufacturing plants provide employment for a large number of workers from Vigo County and surrounding areas.

The Milwaukee Road, Penn Central, and Louisville and Nashville Railroads as well as airlines and buslines service the county. U.S. Highways Nos. 41, 150, and 40, State Roads Nos. 42, 46, and 63, and Interstate Highway No. 70 pass through the county.

Markets for livestock are within a reasonable distance. Terre Haute and Indianapolis are the major markets. Other markets are Linton and Sullivan.

Grain elevators and truck and rail transportation provide adequate facilities for handling grain at harvest time.

Farming

Farming in Vigo County is based mostly on growing grain and raising livestock, chiefly hogs and cattle. Corn, soybeans, and wheat are the main crops. In the last few years, the acres planted to grain sorghum have been increasing. Most of the planting has taken place on the more sandy soils and on river bottoms. Red clover, alfalfa, and grass mixtures are grown in most meadows and pastures. In recent years, straight fescue pastures have been highly successful.

From 1959 to 1964, the number of farms in Vigo County decreased from 1,383 to 1,101, a decrease of 282 farms in 5 years. The average size of farms increased from 130 acres in 1959 to 153 acres in 1964. Sole owners of farms decreased in number from 753 in 1959 to 563 in 1964. The number of part owners decreased from 474 in 1959 to 425 in 1964, and the number of farm managers remained the same—six.

In 1964, 27 percent of the farm income was derived from the sale of livestock and livestock products. The number of cattle has decreased steadily for the last few years, but the number of hogs has fluctuated and decreased considerably since 1959.

Vegetable and melon crops are grown mostly on the sandy soils in the northern and central parts of the county and are grown mainly for farm roadside markets.

Literature Cited

(1) AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS.
1970. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 10, 2 v., illus.

(2) CLARK, DOROTHY J.
1968. HISTORY OF VIGO COUNTY, INDIANA, AND ITS TOWNSHIPS. Vigo County Historical Society, Inc., 36 pp.

(3) SIMONSON, ROY W.
1962. SOIL CLASSIFICATION IN THE UNITED STATES. 137: 1027–1034.

(4) UNITED STATES DEPARTMENT OF AGRICULTURE.
1951. SOIL SURVEY MANUAL. U.S. Dept. Agr. Handbook 18, 503 pp., illus.

(5) ———
1960. SOIL CLASSIFICATION, A COMPREHENSIVE SYSTEM, 7TH APPROXIMATION. 265 pp., illus. [Supplements issued in March 1967 and in September 1968]

(6) ———
1961. LAND-CAPABILITY CLASSIFICATION. U.S. Dept. Agr. Handbook 210. 21 pp.

(7) UNITED STATES DEPARTMENT OF DEFENSE.
1968. UNIFIED SOIL CLASSIFICATION SYSTEM FOR ROADS, AIRFIELDS, EMBANKMENTS, AND FOUNDATIONS. MIL–STD–619A, 30 pp., illus.

(8) WATKINS, F. A., JR. and JORDAN, D. G.
1963. GROUND-WATER RESOURCES OF WEST-CENTRAL INDIANA. Bulletin No. 17, Preliminary Report: Vigo County, Indiana Department of Conservation, Division of Water Resources.

Glossary

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Internal soil drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by height of the water table, either permanent or perched. Relative terms for expressing internal drainage are *none, very slow, slow, medium, rapid,* and *very rapid.*

Leaching. The removal of soluble materials from soils or other material by percolating water.

Loess. Fine-grained material, dominantly of silt-sized particles, that has been deposited by wind.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils generally indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality that enables a soil horizon to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Slope classes. The following slope classes are used in this soil survey:

Nearly level	0 to 2 percent.
Gently sloping	2 to 6 percent.
Moderately sloping	6 to 12 percent.
Strongly sloping	12 to 18 percent.
Moderately steep	18 to 25 percent.
Steep	25 to 35 percent.
Very steep	More than 35 percent.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles, less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *Very coarse sand* (2.0 to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeter); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

☆ U.S. GOVERNMENT PRINTING OFFICE 1974——557–139/32

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which it belongs. In referring to a capability unit, read the introduction to the section it is in for general information about its management. Facts about woodlands are given on page 52. For information about wildlife, see page 53. Other information is given in tables as follows:

Acreage and extent, table 1, page 11.
Estimated yields, table 2, page 51.
Limitations of soils for recreational sites, table 5, page 63.

Engineering uses of the soils, tables 6, 7, 8, and 9, pages 70 through 113.

Map symbol	Mapping unit	Described on page	Capability unit		Tree and shrub group
			Symbol	Page	Number
AdB	Ade loamy fine sand, 2 to 6 percent slopes	11	IIIs-1	48	IV
AdC	Ade loamy fine sand, 6 to 12 percent slopes	11	IIIe-12	46	IV
AlB2	Alford silt loam, 2 to 6 percent slopes, eroded	12	IIe-3	44	III
AlC2	Alford silt loam, 6 to 12 percent slopes, eroded	12	IIIe-3	46	III
AlC3	Alford silt loam, 6 to 12 percent slopes, severely eroded	12	IVe-3	49	III
AlD2	Alford silt loam, 12 to 18 percent slopes, eroded	13	IVe-3	49	III
AlD3	Alford silt loam, 12 to 18 percent slopes, severely eroded	13	VIe-1	50	III
AlE2	Alford silt loam, 18 to 25 percent slopes, eroded	13	VIe-1	50	III
AlF	Alford silt loam, 25 to 40 percent slopes	13	VIe-1	50	III
Ar	Armiesburg silty clay loam	13	I-2	44	III
AvB2	Ava silt loam, 2 to 6 percent slopes, eroded	14	IIe-7	44	II
Ay	Ayrshire fine sandy loam	15	IIIw-4	47	II
Ba	Bartle silt loam	16	IIw-2	45	II
BlB	Bloomfield loamy fine sand, 2 to 6 percent slopes	16	IIIs-1	48	IV
BlC	Bloomfield loamy fine sand, 6 to 12 percent slopes	16	IIIe-12	46	IV
BlD	Bloomfield loamy fine sand, 12 to 18 percent slopes	16	IVe-12	49	IV
Bp	Borrow pits	17	-------	--	V
CaA	Camden silt loam, 0 to 2 percent slopes	17	I-1	44	III
CaB	Camden silt loam, 2 to 6 percent slopes	17	IIe-3	44	III
CnC2	Cincinnati silt loam, 6 to 12 percent slopes, eroded	18	IIIe-7	46	II
CnC3	Cincinnati silt loam, 6 to 12 percent slopes, severely eroded	18	IVe-7	49	II
CnD3	Cincinnati silt loam, 12 to 18 percent slopes, severely eroded	18	VIe-1	50	II
Co	Cory silt loam	19	IIw-2	45	II
Cr	Crane silt loam	20	IIw-2	45	II
Ee	Eel silt loam	20	I-2	44	III
ElA	Elston sandy loam, 0 to 2 percent slopes	21	IIIs-2	48	IV
ElB	Elston sandy loam, 2 to 6 percent slopes	22	IIIe-13	46	IV
Fn	Fincastle silt loam	22	IIw-2	45	II
FoA	Fox sandy loam, 0 to 2 percent slopes	23	IIIs-2	48	IV
FoB2	Fox sandy loam, 2 to 6 percent slopes, eroded	23	IIIe-13	46	IV
FxC3	Fox clay loam, 6 to 12 percent slopes, severely eroded	23	IVe-13	49	IV
Ge	Genesee silt loam	23	I-2	44	III
Gf	Genesee fine sandy loam, sandy variant	24	I-2	44	III
Gp	Gravel pits	24	VIIe-3	50	V
HeG	Hennepin loam, 25 to 50 percent slopes	25	VIIe-2	50	V
HkE	Hickory loam, 18 to 25 percent slopes	25	VIe-1	50	III
HkF	Hickory loam, 25 to 40 percent slopes	25	VIIe-1	50	III
IvA	Iva silt loam, 0 to 2 percent slopes	26	IIw-2	45	II
IvB	Iva silt loam, 2 to 4 percent slopes	26	IIw-2	45	II
Ma	Made land	26	VIIe-3	50	V
Md	Millsdale silty clay loam	27	IIIw-5	48	I
MuA	Muren silt loam, 0 to 2 percent slopes	27	I-1	44	III
MuB2	Muren silt loam, 2 to 6 percent slopes, eroded	27	IIe-3	44	III
NeE	Negley loam, 18 to 25 percent slopes	28	VIe-1	50	III
NeF	Negley loam, 25 to 40 percent slopes	28	VIIe-1	50	III
PaB2	Parke silt loam, 2 to 6 percent slopes, eroded	29	IIe-1	44	III
PaD2	Parke silt loam, 12 to 18 percent slopes, eroded	29	IVe-1	49	III
Pe	Petrolia silty clay loam	29	IIw-7	46	I
PrB	Princeton fine sandy loam, 2 to 6 percent slopes	30	IIe-11	45	III
PrC2	Princeton fine sandy loam, 6 to 12 percent slopes, eroded	30	IIIe-15	47	III
PrD2	Princeton fine sandy loam, 12 to 18 percent slopes, eroded	30	IVe-15	50	III
PrE2	Princeton fine sandy loam, 18 to 25 percent slopes, eroded	30	VIe-1	50	III
Pt	Proctor silt loam	31	I-1	44	III
Ra	Ragsdale silt loam	31	IIw-1	45	I
RdA	Randolph silt loam, 0 to 3 percent slopes	32	IIIw-7	48	II
Re	Reesville silt loam	33	IIw-2	45	II
Rg	Rensselaer loam	33	IIw-1	45	I
Rn	Rensselaer clay loam	33	IIw-1	45	I
RoG	Rodman gravelly loam, 25 to 50 percent slopes	34	VIIs-1	50	V
RuB2	Russell silt loam, 2 to 6 percent slopes, eroded	34	IIe-3	44	III
RuC2	Russell silt loam, 6 to 12 percent slopes, eroded	34	IIIe-3	46	III
RuC3	Russell silt loam, 6 to 12 percent slopes, severely eroded	34	IVe-3	49	III
RuD2	Russell silt loam, 12 to 18 percent slopes, eroded	34	IVe-3	49	III
Sh	Shoals silt loam	35	IIw-7	46	I
So	Sloan clay loam	35	IIIw-9	48	I
St	Strip mines	36	VIIe-3	50	V
Tp	Tippecanoe silt loam	37	I-1	44	III
Vn	Vincennes loam	38	IIw-1	45	I
Wa	Wakeland silt loam	38	IIw-7	46	I
WrA	Warsaw sandy loam, 0 to 2 percent slopes	39	IIIs-2	48	IV
WrB2	Warsaw sandy loam, 2 to 6 percent slopes, eroded	39	IIIe-13	46	IV
Ws	Washtenaw silt loam	40	IIw-1	45	I
Wt	Westland clay loam	41	IIw-1	45	I
Wx	Whitaker loam	41	IIw-2	45	II
XeB2	Xenia silt loam, 2 to 6 percent slopes, eroded	42	IIe-3	44	III
Zp	Zipp silty clay	42	IIIw-2	47	I

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

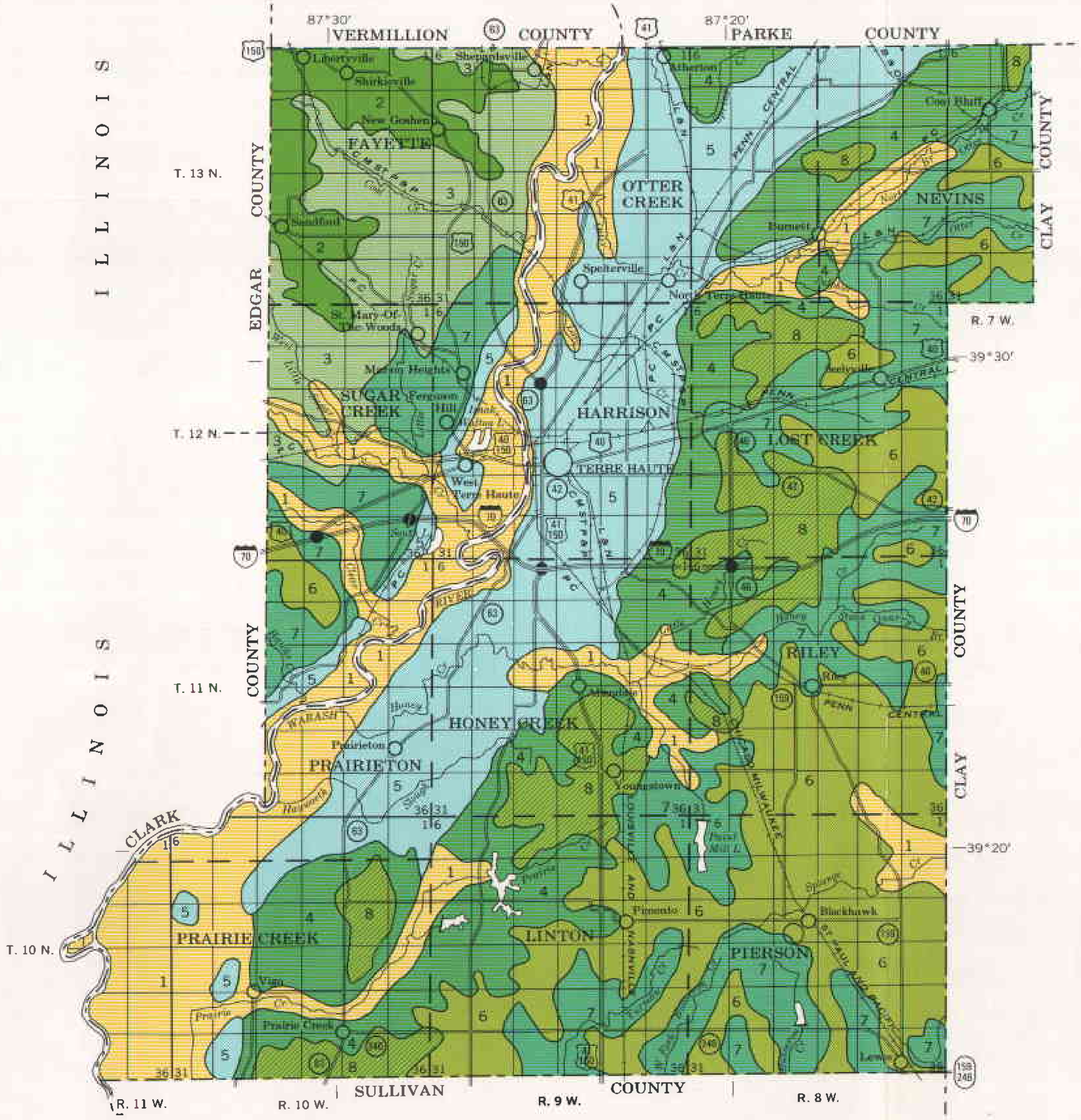
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

VIGO COUNTY, INDIANA

1 0 1 2 3 4 Miles

N



SOIL ASSOCIATIONS *

1	Genesee-Petrolia-Armiesburg association: Deep, well-drained and poorly drained, medium-textured and moderately fine textured, nearly level soils on bottom lands
🟩	Fincastle-Ragsdale association: Deep, somewhat poorly drained and very poorly drained, medium-textured and moderately fine textured, nearly level soils on uplands
3	Hennepin-Russell-Xenia association: Deep, well drained and moderately well drained, medium-textured, strongly acid to neutral, gently sloping to very steep soils on uplands
🟩	Princeton-Ayrshire-Alford association: Deep, well-drained and somewhat poorly drained, moderately coarse textured and medium-textured, nearly level to very steep soils on uplands
5	Elston-Warsaw-Rensselaer association: Deep, well-drained and very poorly drained, moderately coarse textured, medium-textured, and moderately fine textured, nearly level to gently sloping soils on terraces
▨	Iva-Cory association: Deep, somewhat poorly drained, medium-textured, nearly level to gently sloping soils on uplands
🟩	Hickory-Cincinnati-Ava association: Deep, well drained and moderately well drained, medium-textured, very strongly acid and strongly acid, gently sloping to very steep soils on uplands
▨	Reesville-Ragsdale association: Deep, somewhat poorly drained and very poorly drained, medium-textured, nearly level to slightly depressional soils on uplands

* Texture refers to the surface layer of the major soils.

Compiled 1972

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

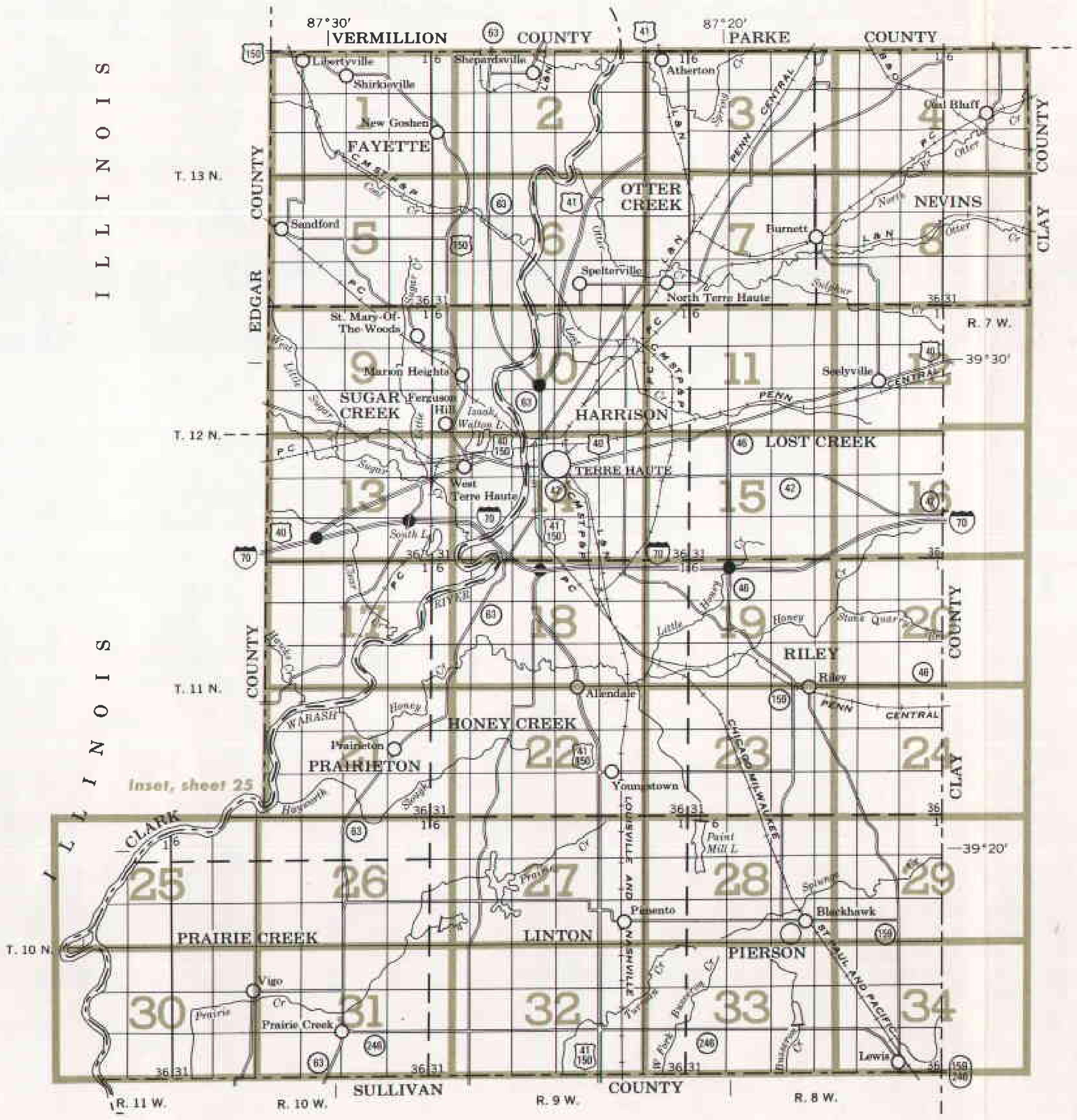
SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS
VIGO COUNTY, INDIANA

Scale 1:190,080

1 0 1 2 3 4 Miles



N

SECTIONALIZED TOWNSHIP

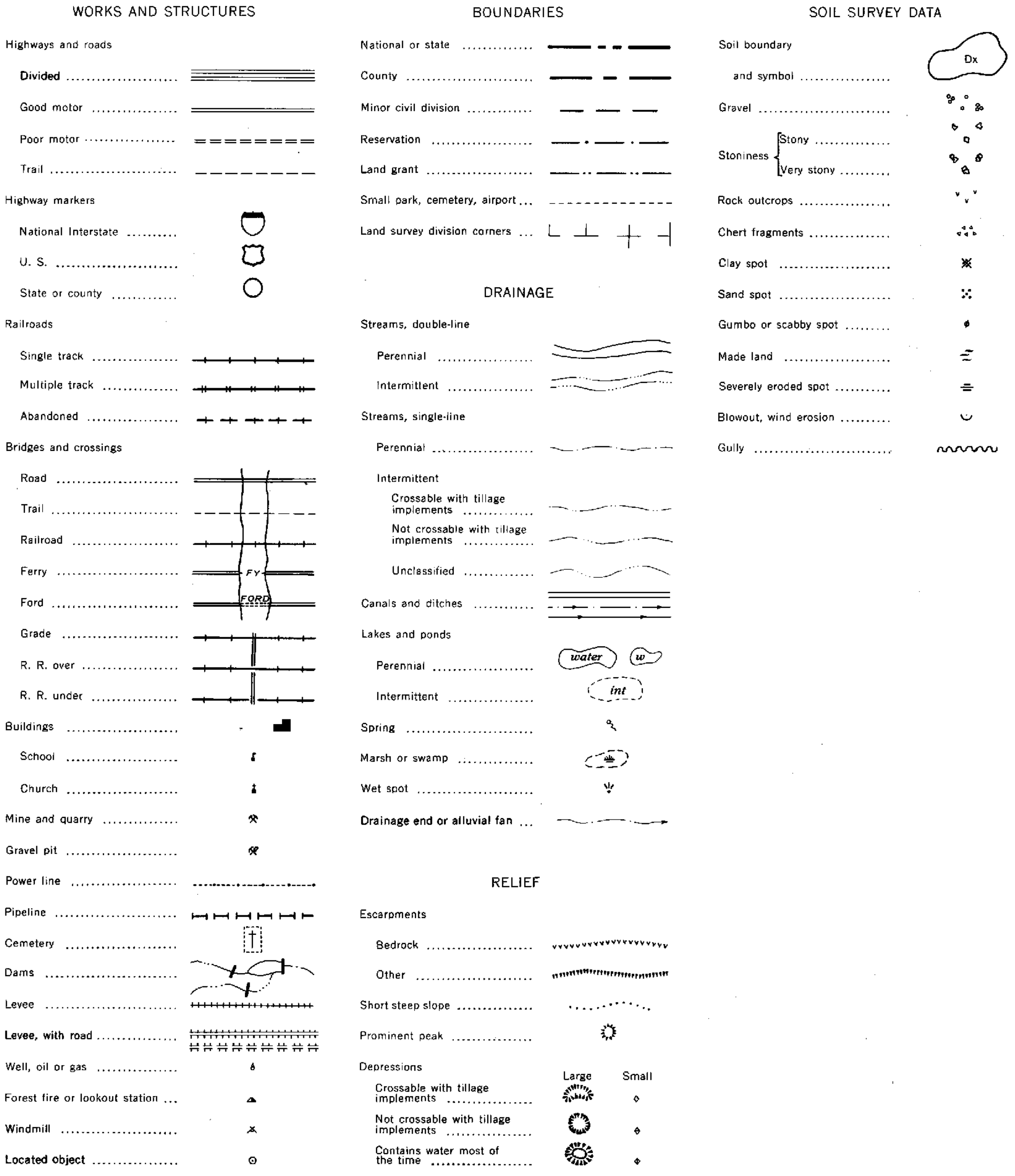
6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

VIGO COUNTY, INDIANA

PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

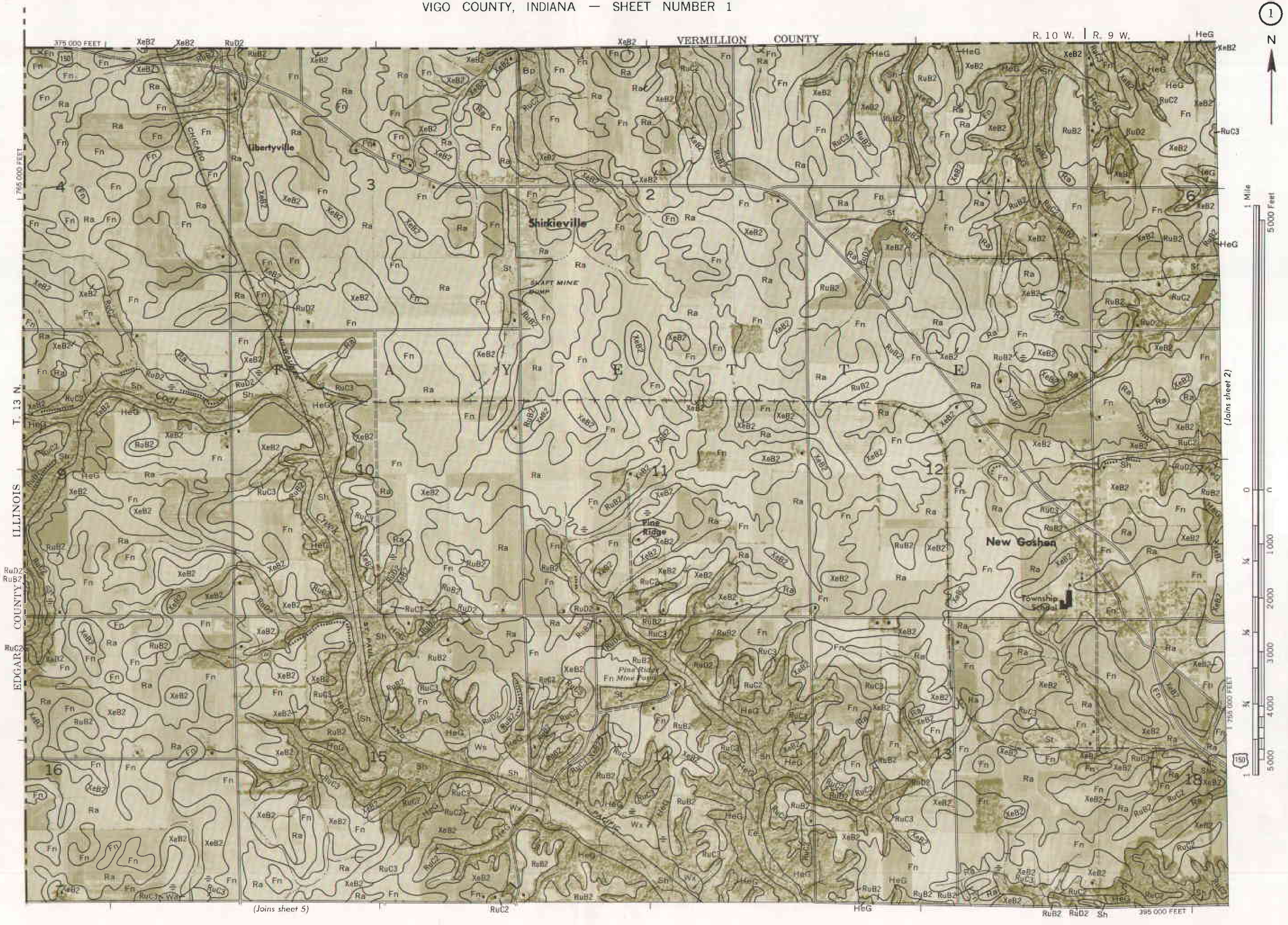
CONVENTIONAL SIGNS



SOIL LEGEND

The first capital letter is the initial one of the soil name. The lower case letter that follows identifies the soil type or phase except slope and eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are those with a slope range of 0 to 2 percent or they are for land types with a considerable range of slope. A final number 2 or 3 in the symbol indicates that the soil is eroded or severely eroded.

SYMBOL	NAME
AdB	Ade loamy fine sand, 2 to 6 percent slopes
AdC	Ade loamy fine sand, 6 to 12 percent slopes
AlB2	Alford silt loam, 2 to 6 percent slopes, eroded
AlC2	Alford silt loam, 6 to 12 percent slopes, eroded
AlC3	Alford silt loam, 6 to 12 percent slopes, severely eroded
AlD2	Alford silt loam, 12 to 18 percent slopes, eroded
AlD3	Alford silt loam, 12 to 18 percent slopes, severely eroded
AlE2	Alford silt loam, 18 to 25 percent slopes, eroded
AlF	Alford silt loam, 25 to 40 percent slopes
Ar	Armiesburg silty clay loam
AvB2	Ava silt loam, 2 to 6 percent slopes, eroded
Ay	Ayrshire fine sandy loam
Ba	Bartle silt loam
BlB	Bloomfield loamy fine sand, 2 to 6 percent slopes
BlC	Bloomfield loamy fine sand, 6 to 12 percent slopes
BlD	Bloomfield loamy fine sand, 12 to 18 percent slopes
Bp	Borrow pits
CaA	Camden silt loam, 0 to 2 percent slopes
CaB	Camden silt loam, 2 to 6 percent slopes
CnC2	Cincinnati silt loam, 6 to 12 percent slopes, eroded
CnC3	Cincinnati silt loam, 6 to 12 percent slopes, severely eroded
CnD3	Cincinnati silt loam, 12 to 18 percent slopes, severely eroded
Co	Cory silt loam
Cr	Crane silt loam
Ee	Eel silt loam
ElA	Elston sandy loam, 0 to 2 percent slopes
ElB	Elston sandy loam, 2 to 6 percent slopes
Fn	Fincastle silt loam
FoA	Fox sandy loam, 0 to 2 percent slopes
FoB2	Fox sandy loam, 2 to 6 percent slopes, eroded
FxC3	Fox clay loam, 6 to 12 percent slopes, severely eroded
Ge	Genesee silt loam
Gf	Genesee fine sandy loam, sandy variant
Gp	Gravel pits
HeG	Hennepin loam, 25 to 50 percent slopes
HkE	Hickory loam, 18 to 25 percent slopes
HkF	Hickory loam, 25 to 40 percent slopes
IvA	Iva silt loam, 0 to 2 percent slopes
IvB	Iva silt loam, 2 to 4 percent slopes
Ma	Made land
Md	Millsdale silty clay loam
MuA	Muren silt loam, 0 to 2 percent slopes
MuB2	Muren silt loam, 2 to 6 percent slopes, eroded
NeE	Negley loam, 18 to 25 percent slopes
NeF	Negley loam, 25 to 40 percent slopes
PaB2	Parke silt loam, 2 to 6 percent slopes, eroded
PaD2	Parke silt loam, 12 to 18 percent slopes, eroded
Pe	Petrolia silty clay loam
PrB	Princeton fine sandy loam, 2 to 6 percent slopes
PrC2	Princeton fine sandy loam, 6 to 12 percent slopes, eroded
PrD2	Princeton fine sandy loam, 12 to 18 percent slopes, eroded
PrE2	Princeton fine sandy loam, 18 to 25 percent slopes, eroded
Pt	Proctor silt loam
Ra	Ragsdale silt loam
RdA	Randolph silt loam, 0 to 3 percent slopes
Re	Reesville silt loam
Rg	Rensselaer loam
Rn	Rensselaer clay loam
RoG	Rodman gravelly loam, 25 to 50 percent slopes
RuB2	Russell silt loam, 2 to 6 percent slopes, eroded
RuC2	Russell silt loam, 6 to 12 percent slopes, eroded
RuC3	Russell silt loam, 6 to 12 percent slopes, severely eroded
RuD2	Russell silt loam, 12 to 18 percent slopes, eroded
Sh	Shoals silt loam
So	Sloan clay loam
St	Strip mines
Tp	Tippecanoe silt loam
Vn	Vincennes loam
Wa	Wakeland silt loam
WrA	Warsaw sandy loam, 0 to 2 percent slopes
WrB2	Warsaw sandy loam, 2 to 6 percent slopes, eroded
Ws	Washtenaw silt loam
Wt	Westland clay loam
Wx	Whitaker loam
XeB2	Xenia silt loam, 2 to 6 percent slopes, eroded

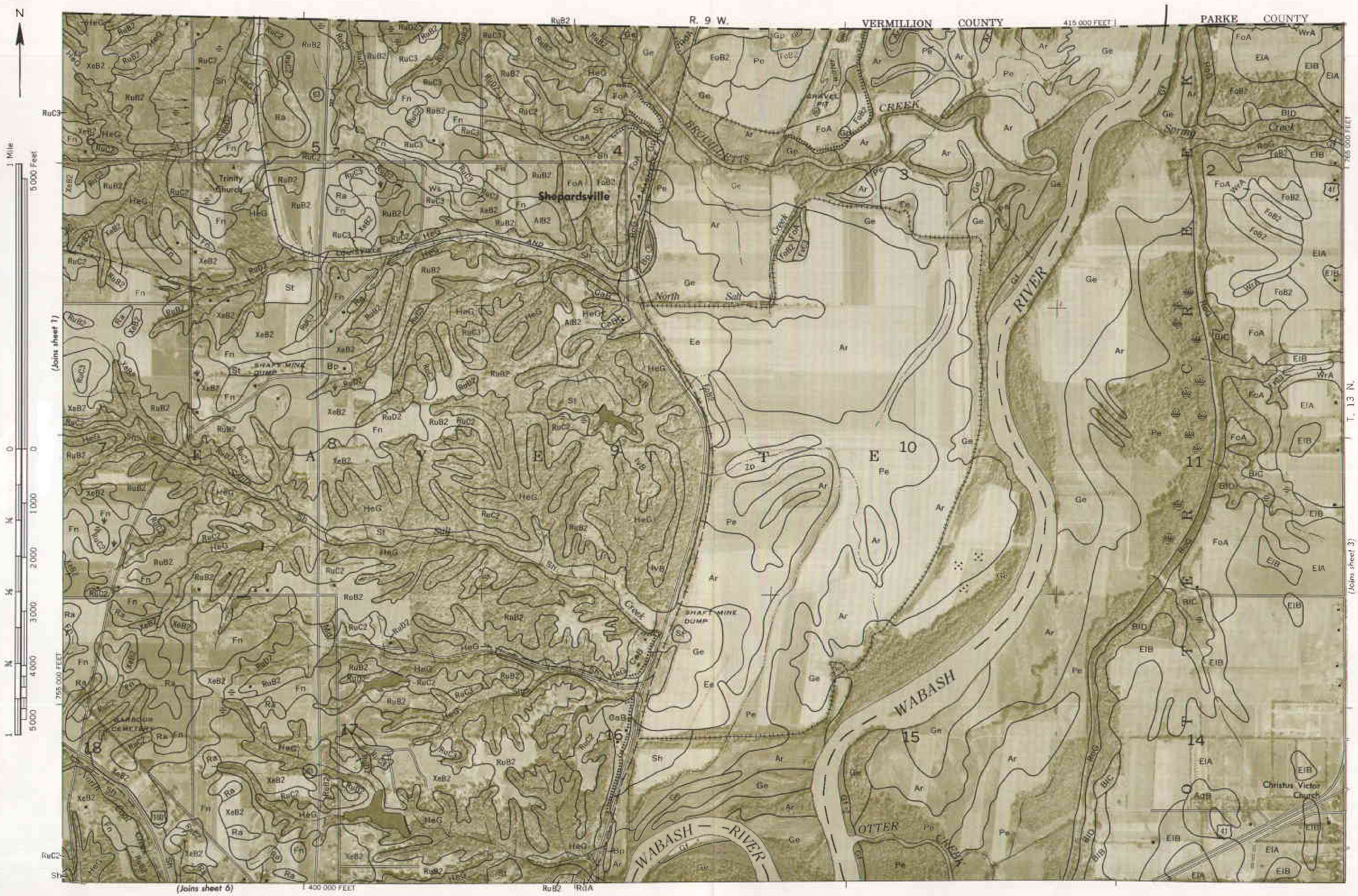


VIGO COUNTY, INDIANA NO. 1

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.

②

VIGO COUNTY, INDIANA — SHEET NUMBER 2



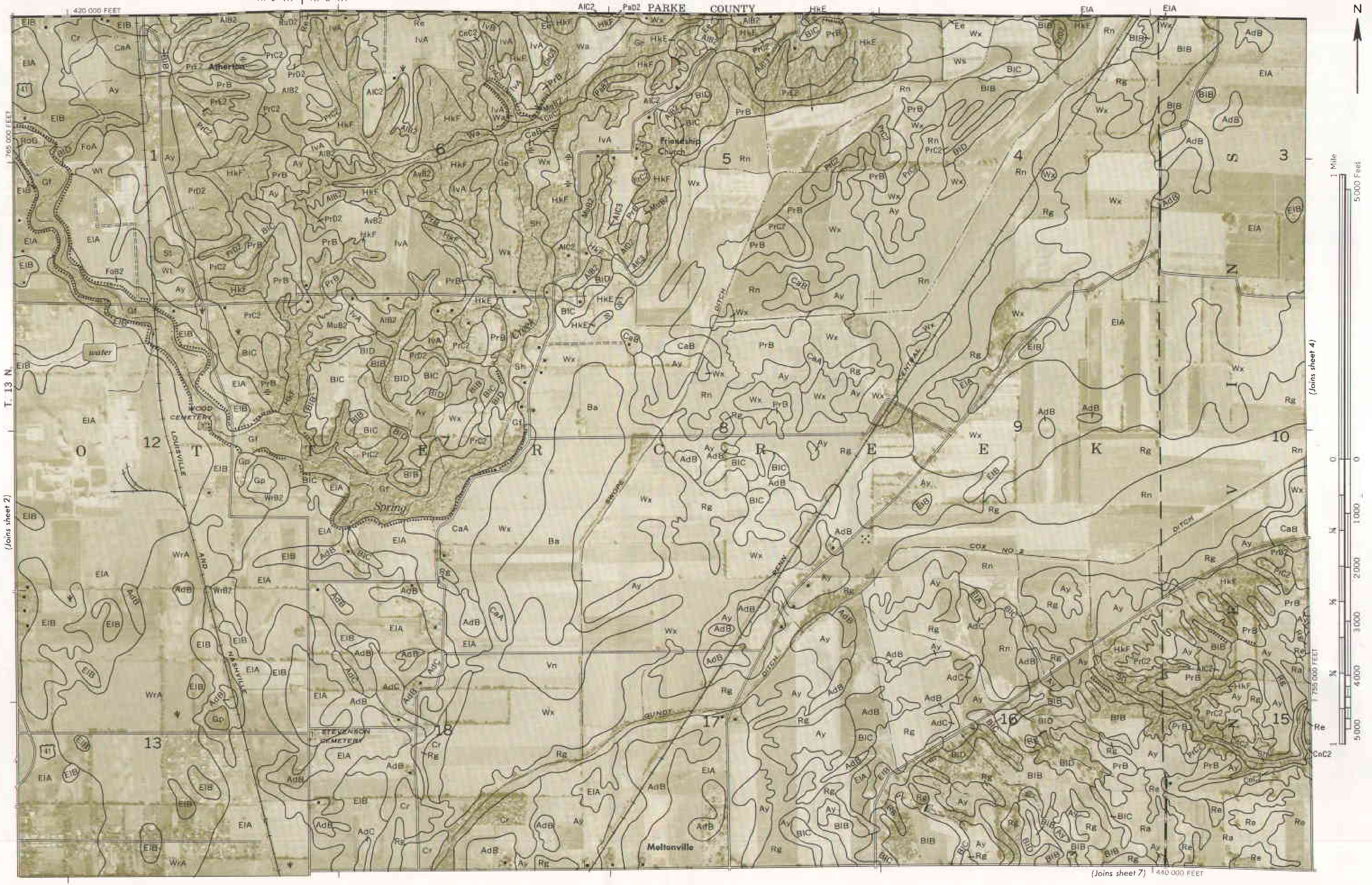
Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

VIGO COUNTY, INDIANA NO. 2

VIGO COUNTY, INDIANA — SHEET NUMBER 3



VIGO COUNTY, INDIANA NO. 3

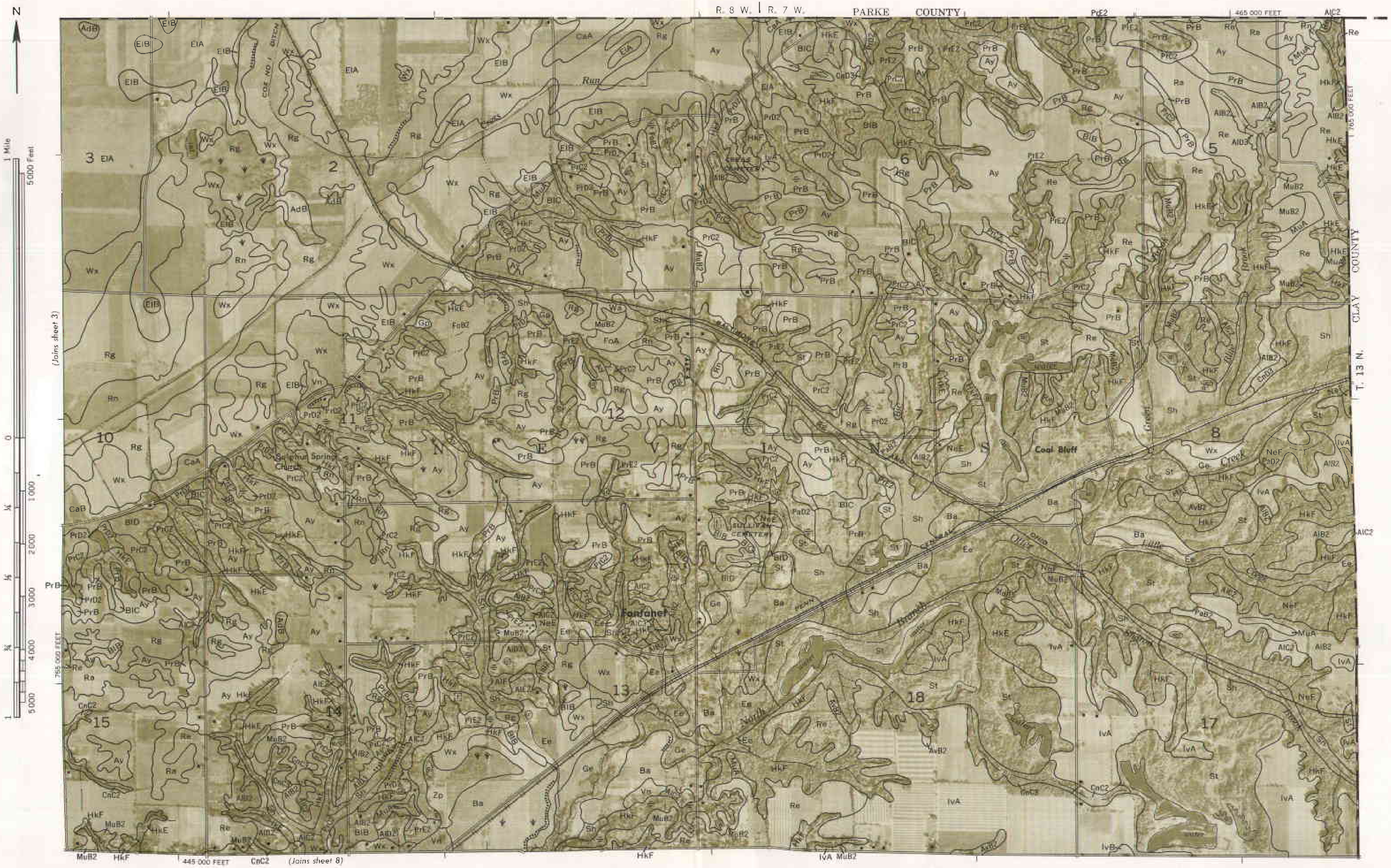
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

④

VIGO COUNTY, INDIANA — SHEET NUMBER 4



Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

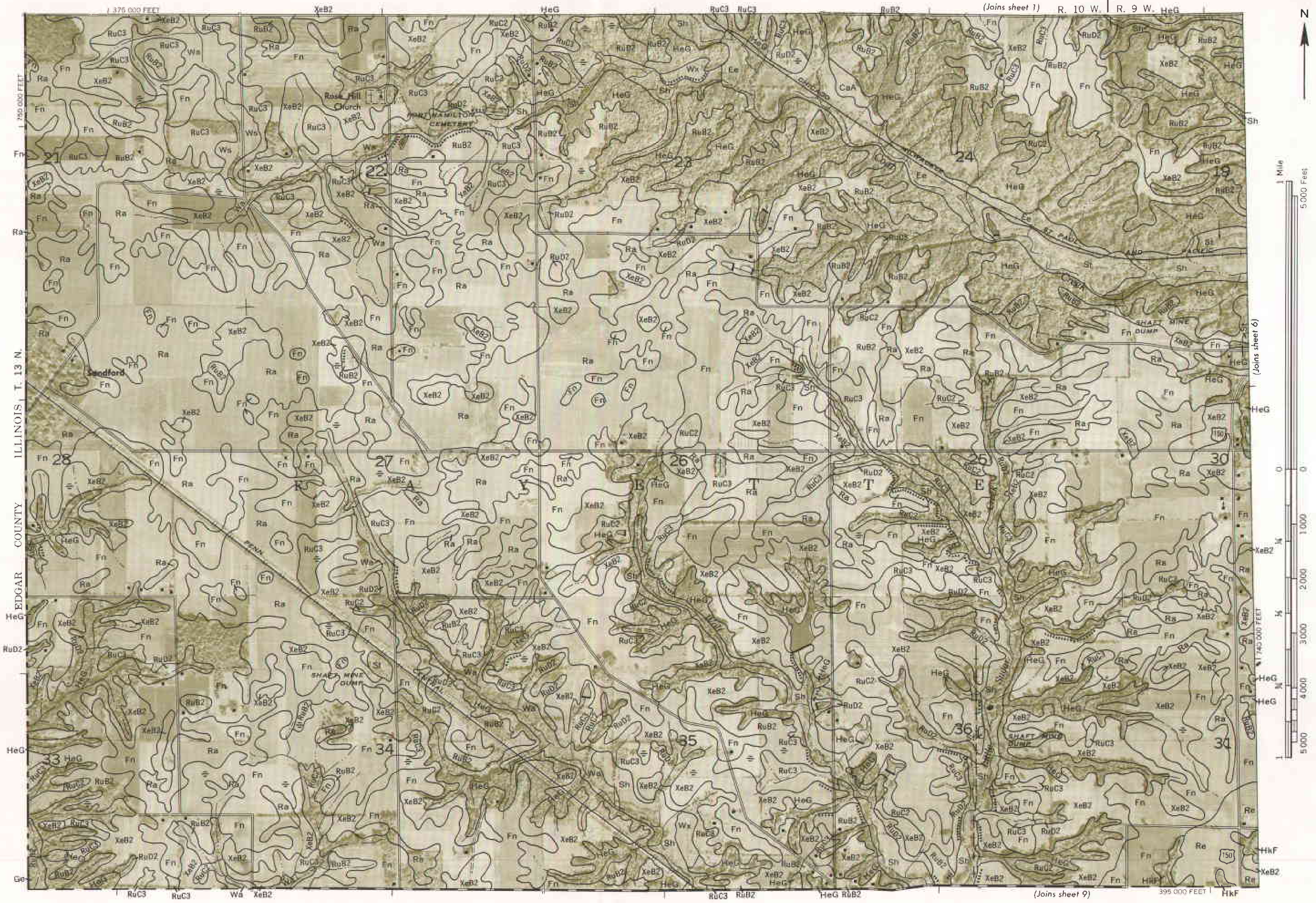
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.

VIGO COUNTY, INDIANA NO. 4

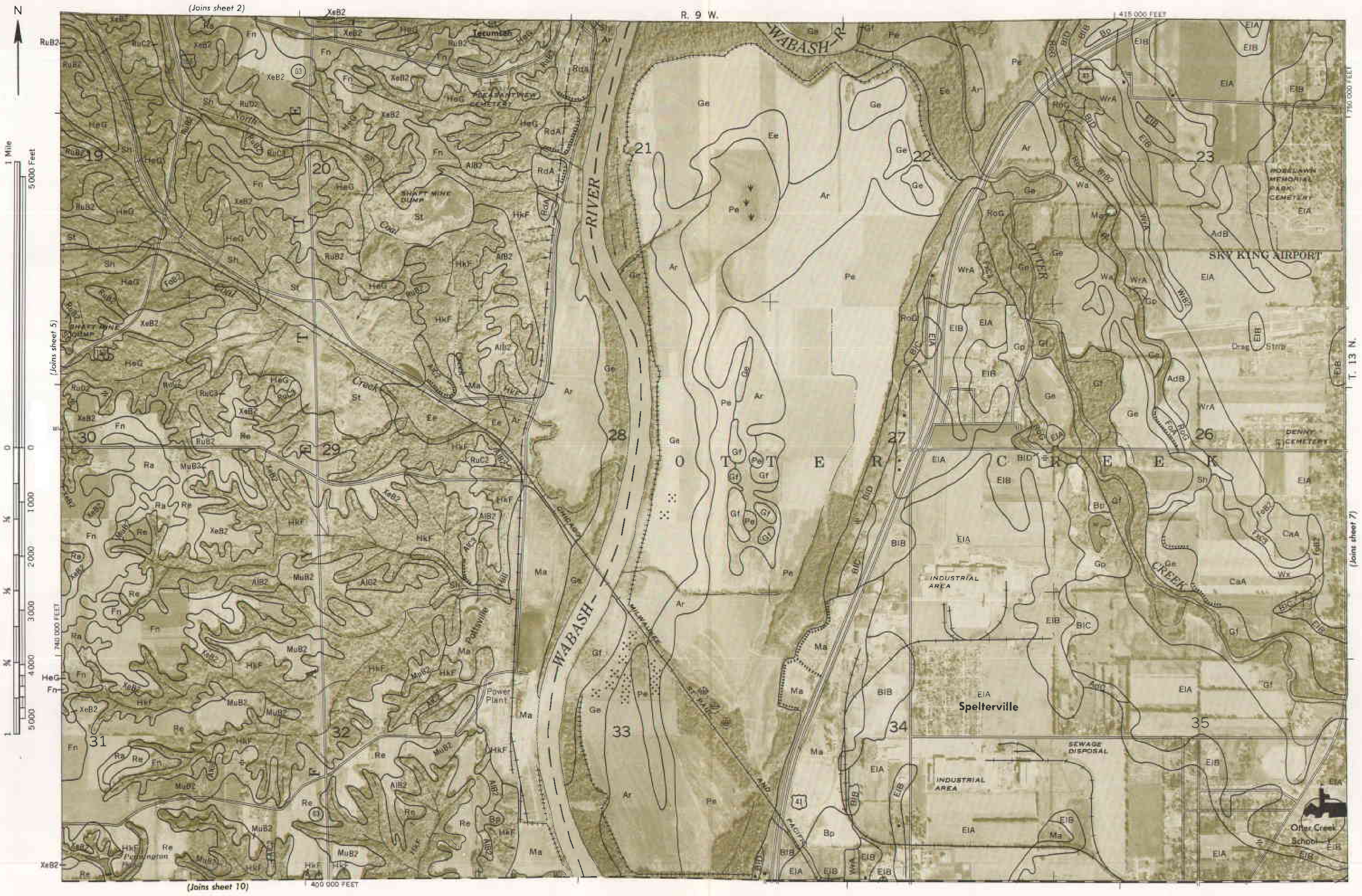
VIGO COUNTY, INDIANA — SHEET NUMBER 5

VIGO COUNTY, INDIANA NO. 5

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.

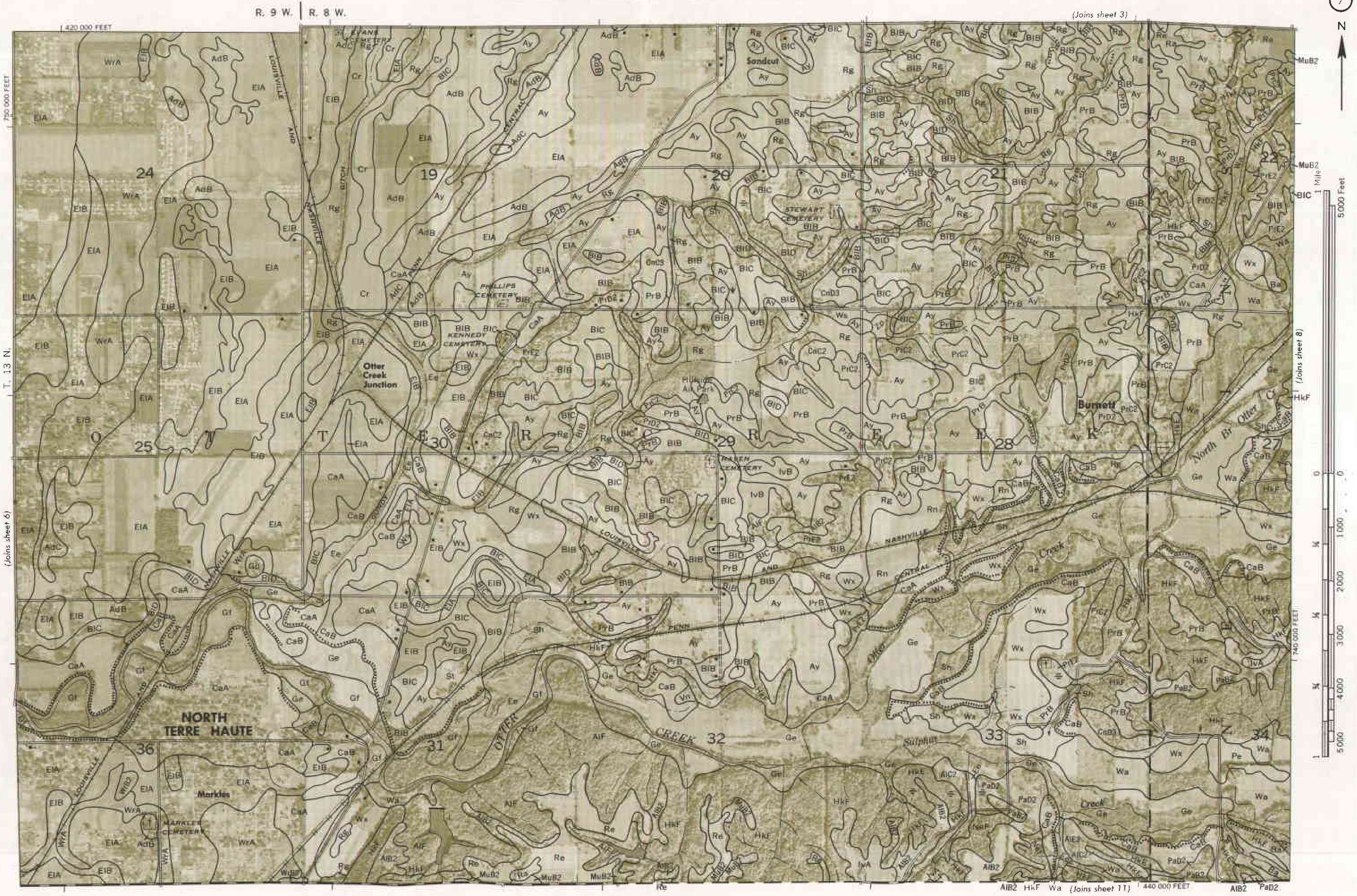


VIGO COUNTY, INDIANA — SHEET NUMBER 6



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.

VIGO COUNTY, INDIANA — SHEET NUMBER 7



VIGO COUNTY, INDIANA NO. 7

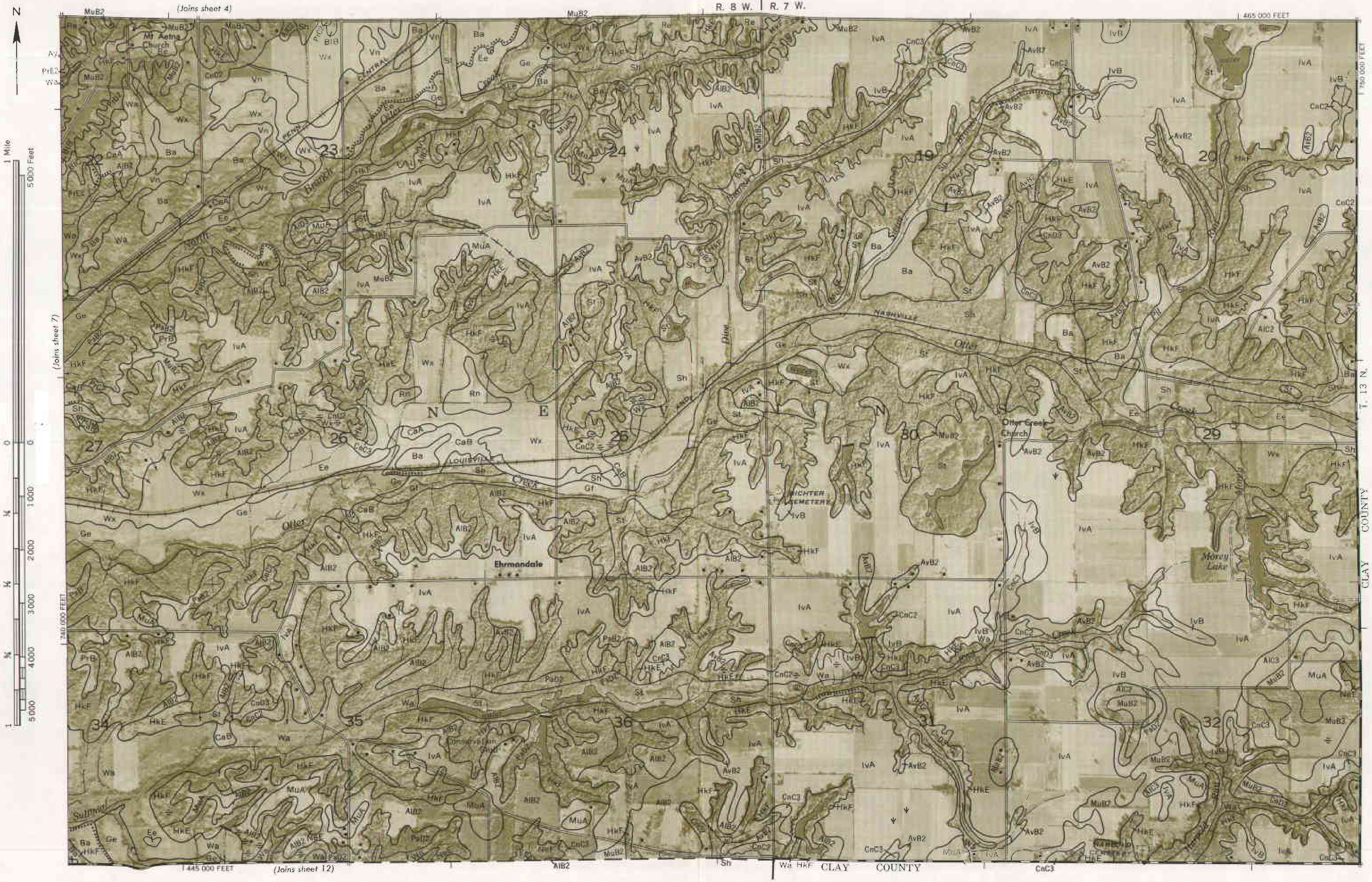
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

⑧

VIGO COUNTY, INDIANA — SHEET NUMBER 8



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

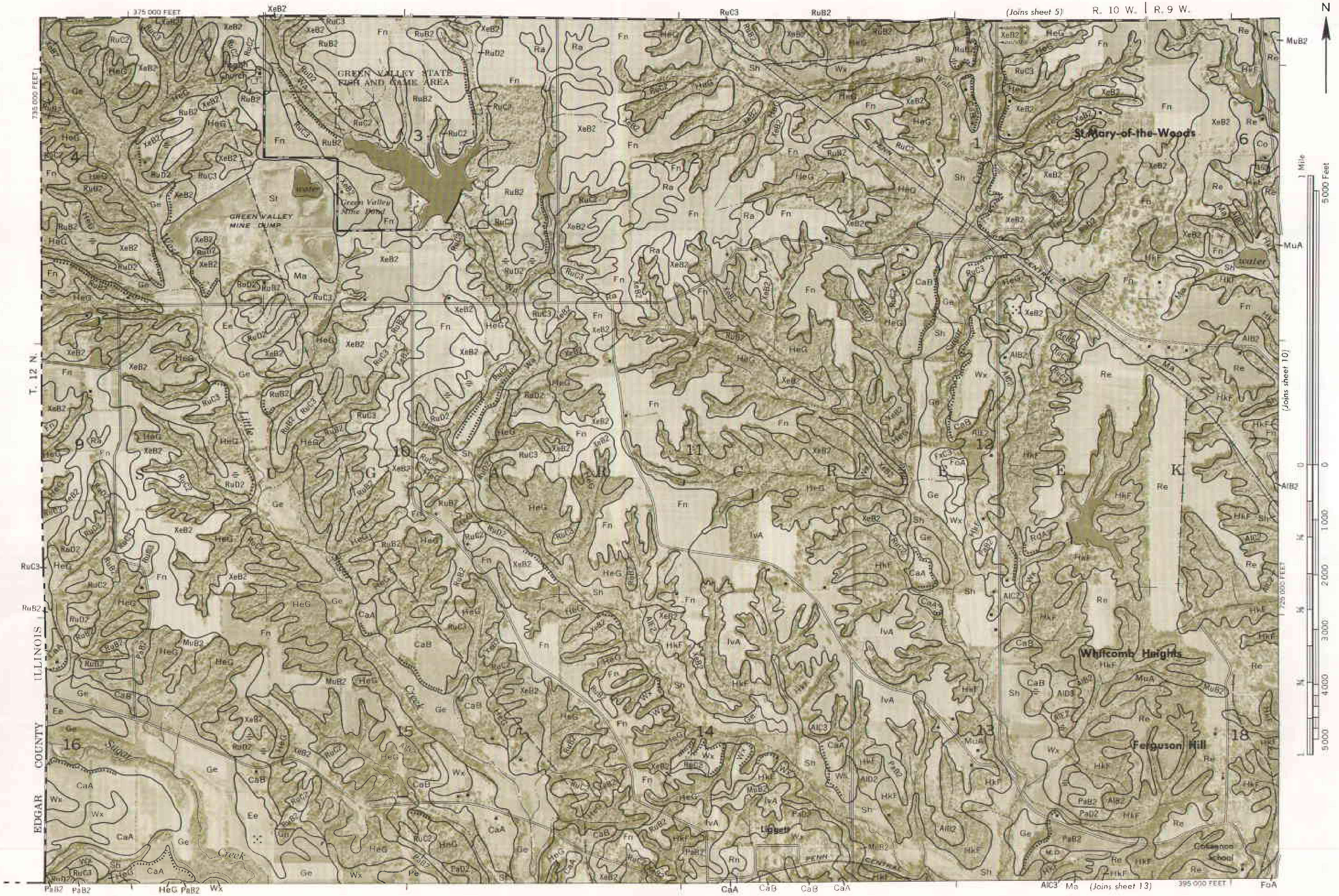
Land division corners are approximately positioned on this map.

VIGO COUNTY, INDIANA NO. 8

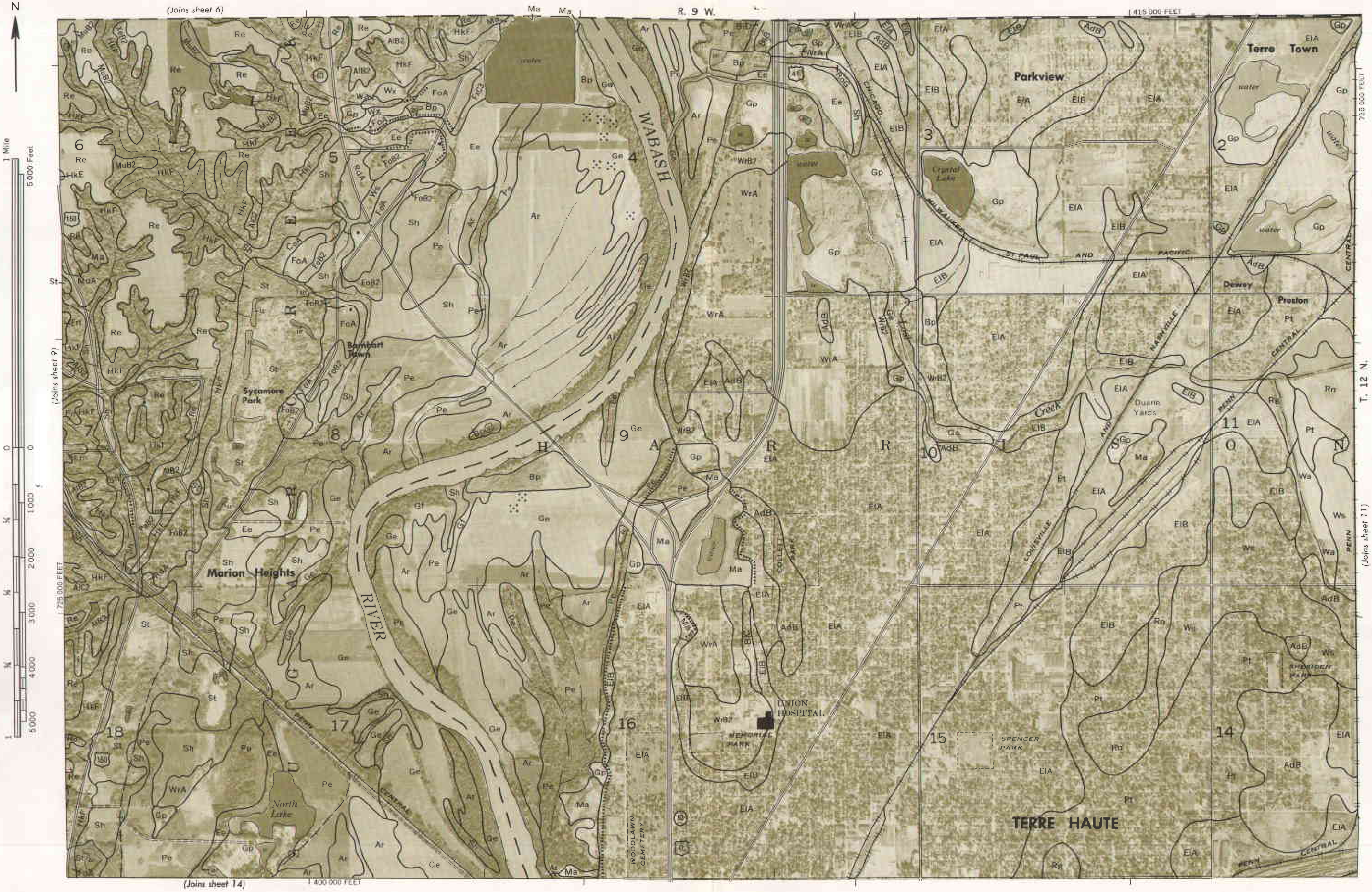
VIGO COUNTY, INDIANA — SHEET NUMBER 9

VIGO COUNTY, INDIANA NO. 9

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station. Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone. Land division corners are approximately positioned on this map.



VIGO COUNTY, INDIANA — SHEET NUMBER 10



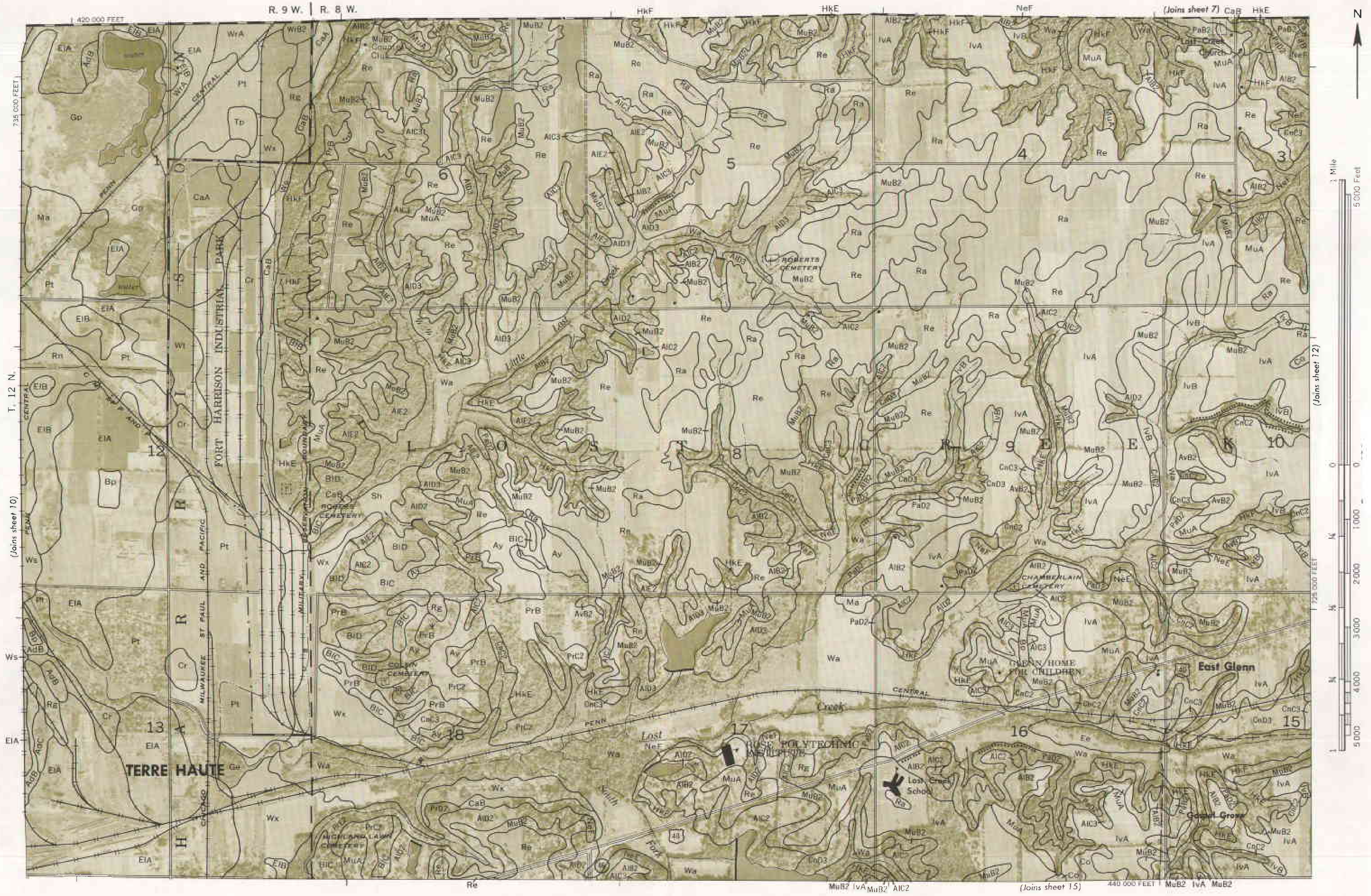
Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

VIGO COUNTY, INDIANA NO. 10

VIGO COUNTY, INDIANA — SHEET NUMBER 11



VIGO COUNTY, INDIANA NO 11

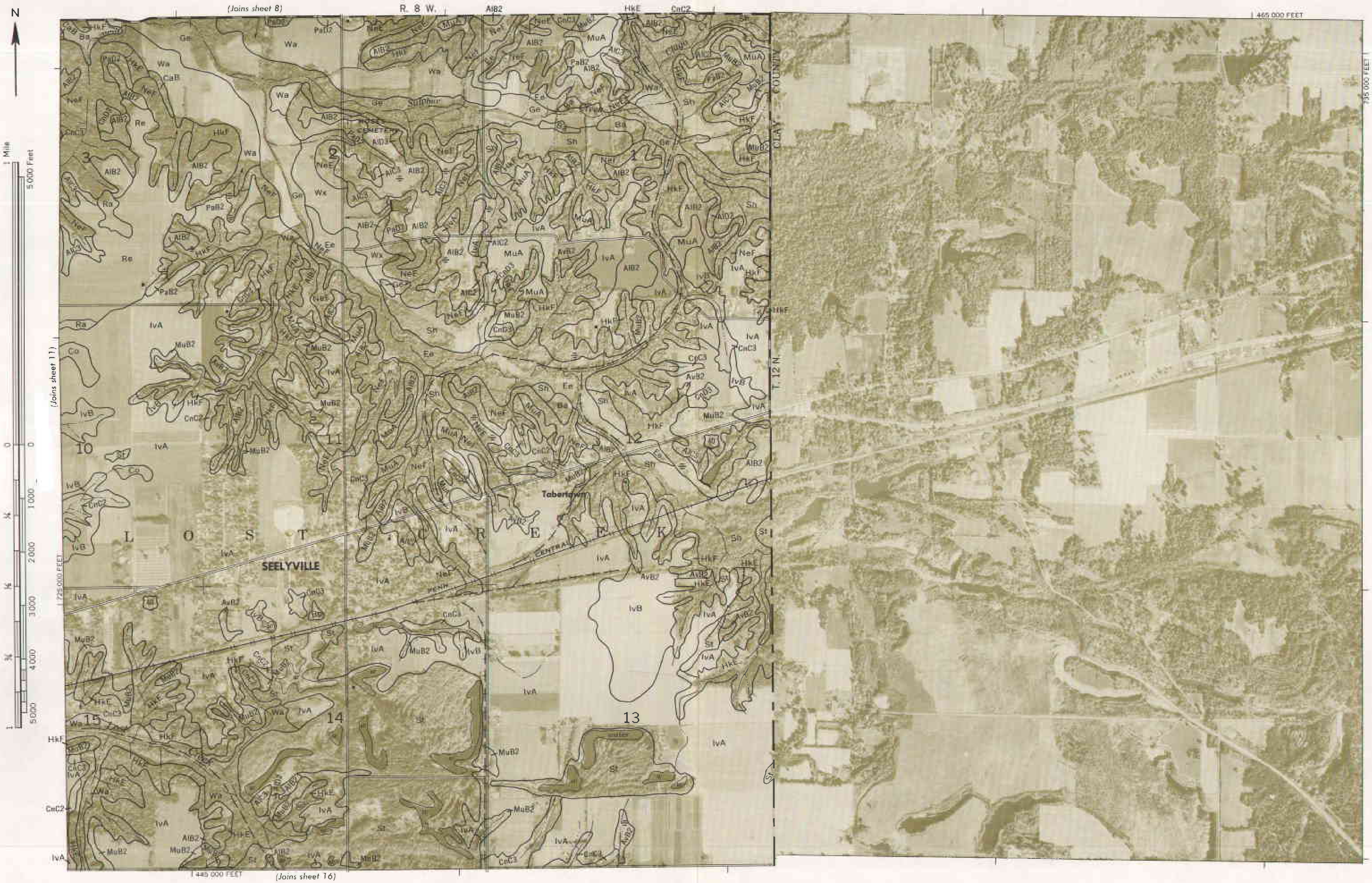
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

⑫

VIGO COUNTY, INDIANA — SHEET NUMBER 12



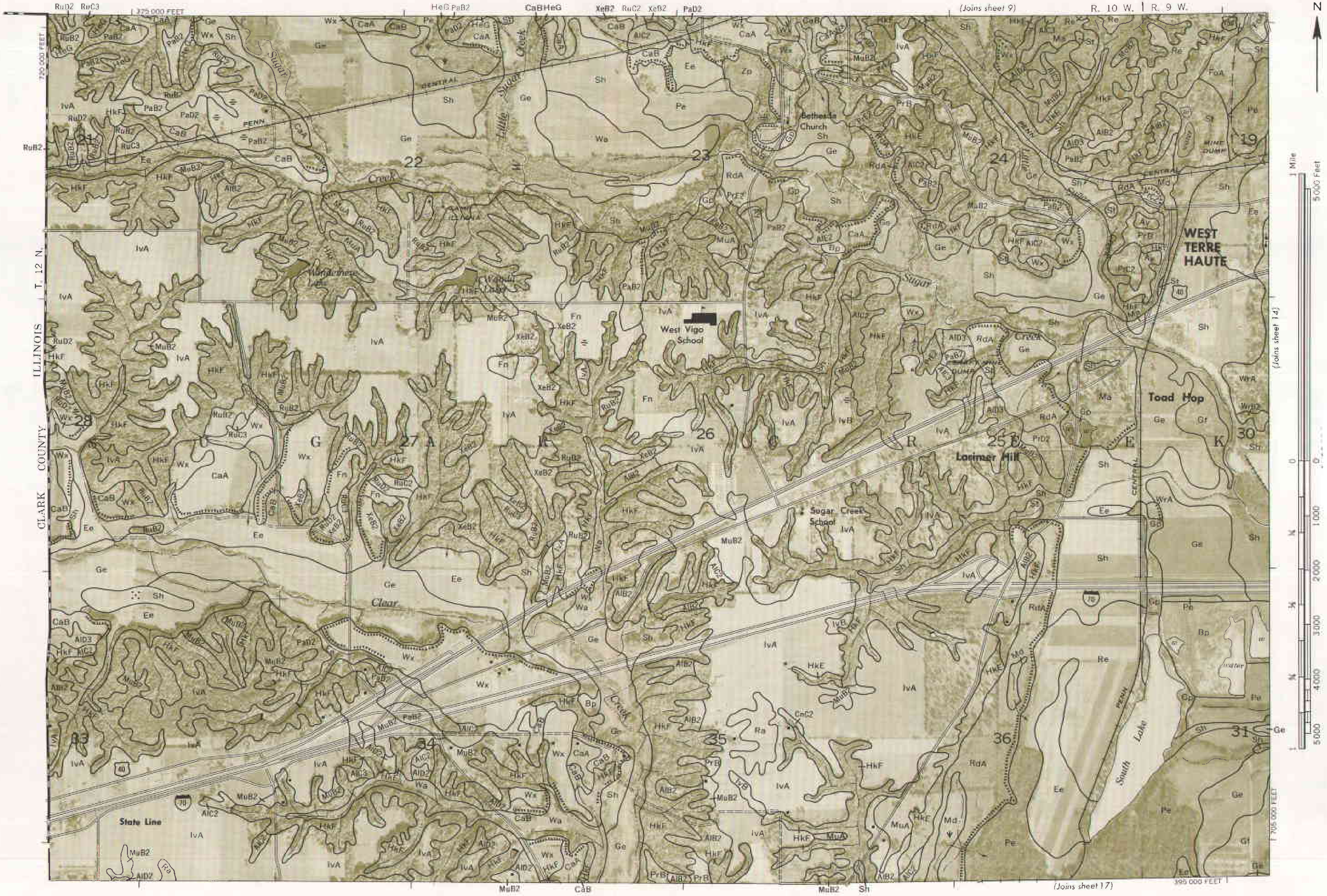
Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

VIGO COUNTY, INDIANA NO. 12

VIGO COUNTY, INDIANA — SHEET NUMBER 13



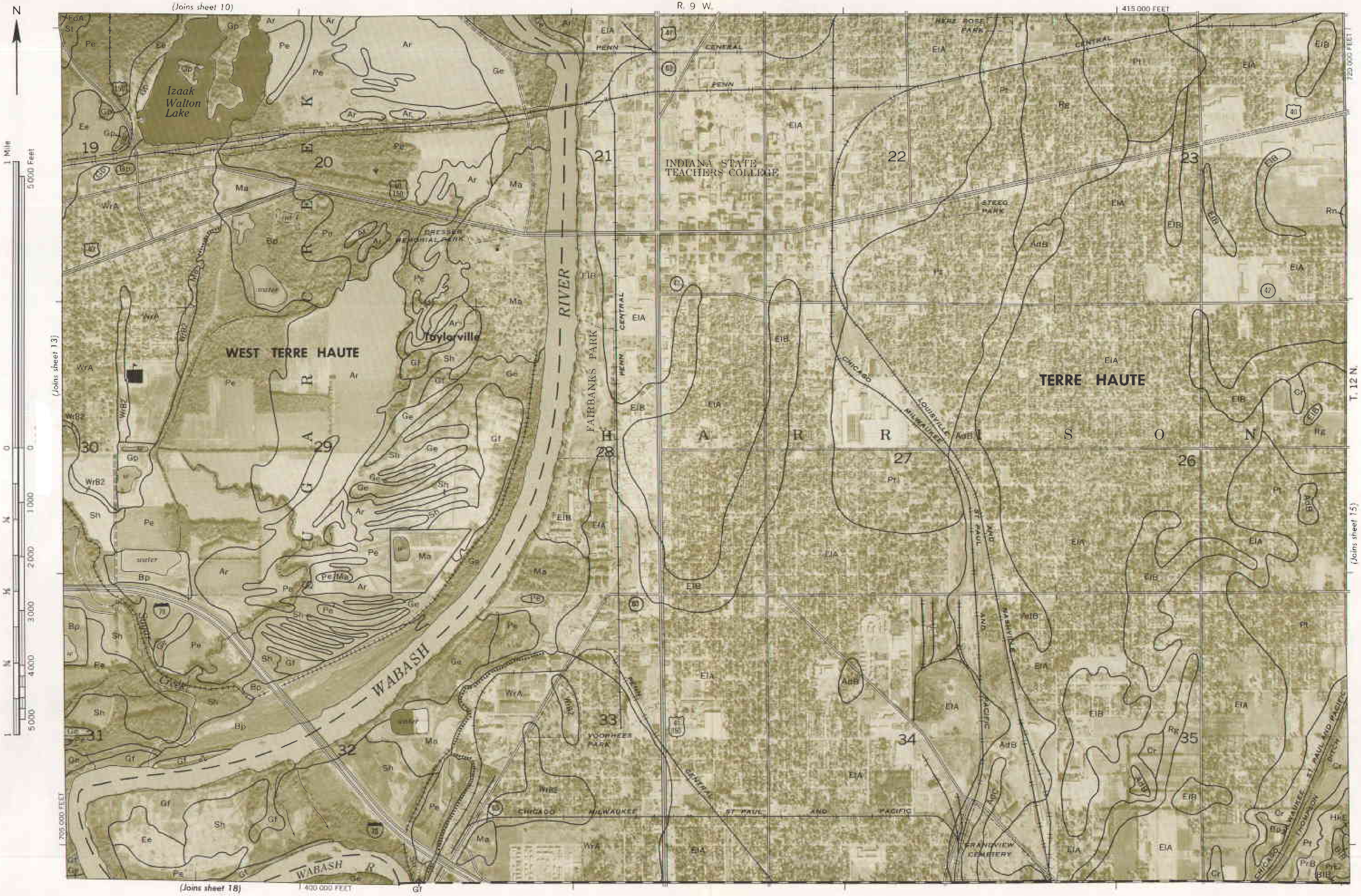
VIGO COUNTY, INDIANA NO. 13

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station. Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

⑭

VIGO COUNTY, INDIANA — SHEET NUMBER 14



Land division corners are approximately positioned on this map.

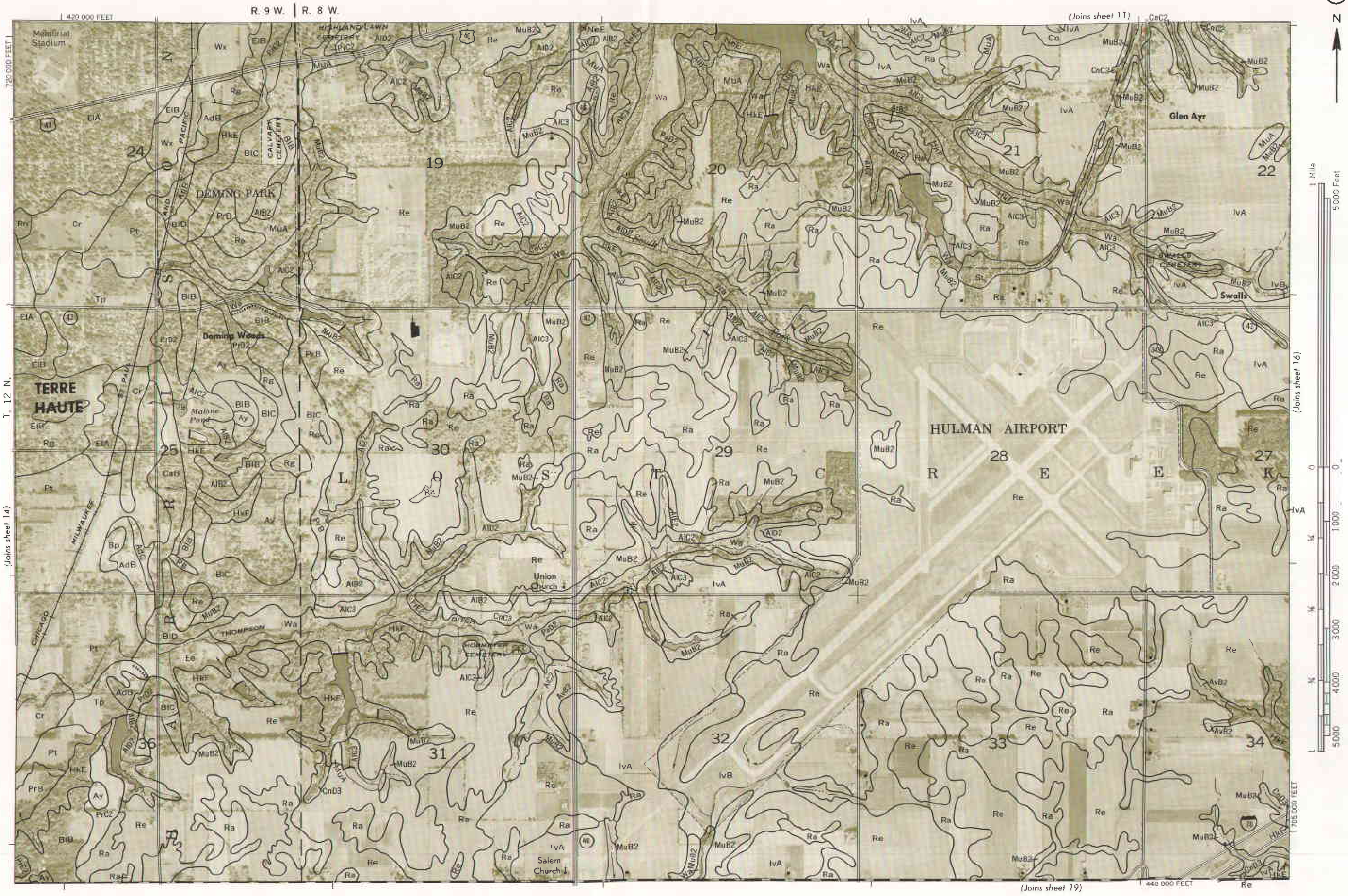
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

VIGO COUNTY, INDIANA NO. 14

VIGO COUNTY, INDIANA — SHEET NUMBER 15

⑮



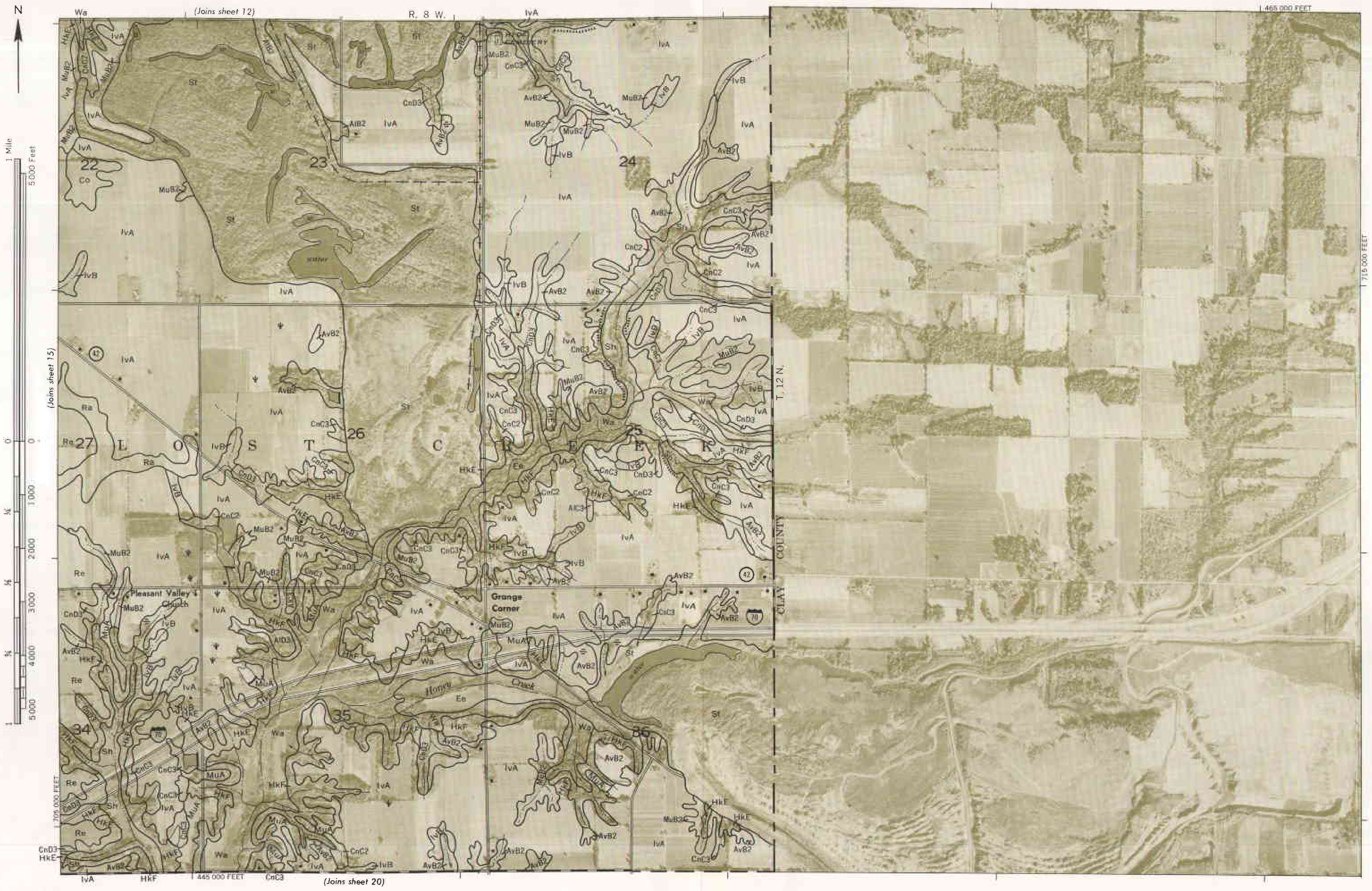
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

VIGO COUNTY, INDIANA NO. 15

VIGO COUNTY, INDIANA — SHEET NUMBER 16



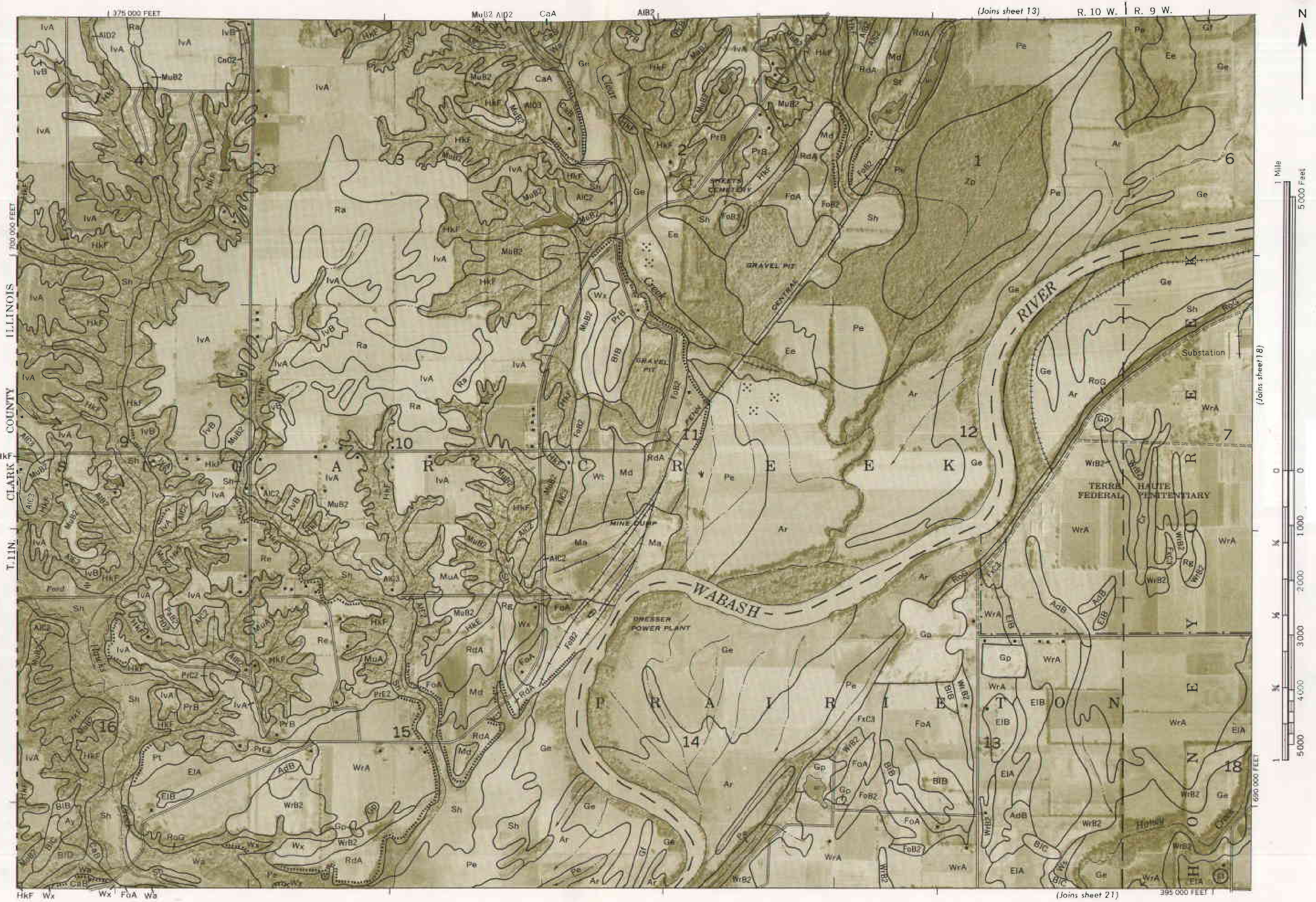
Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

VIGO COUNTY, INDIANA NO. 16

VIGO COUNTY, INDIANA — SHEET NUMBER 17



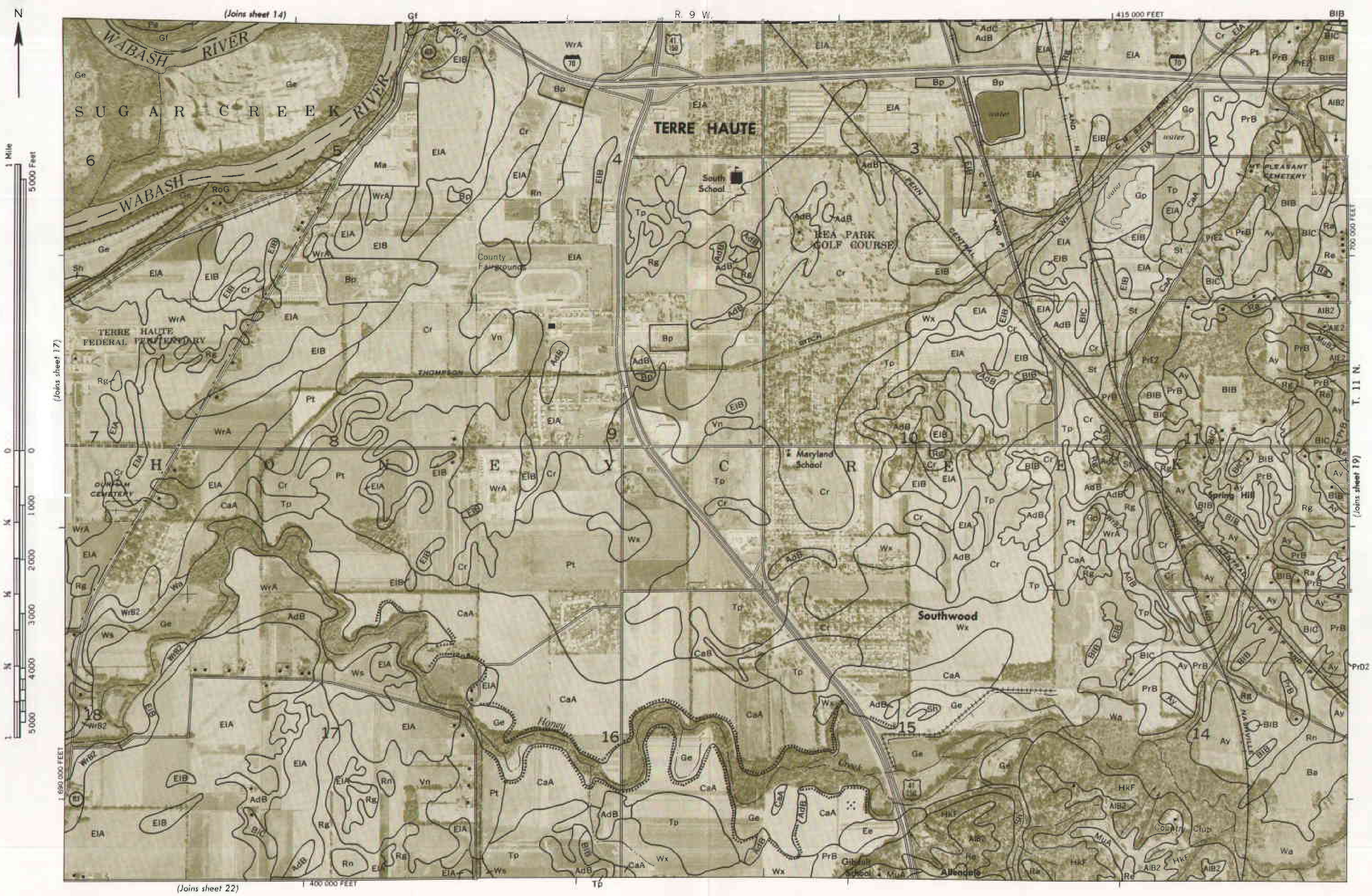
VIGO COUNTY, INDIANA NO. 17

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

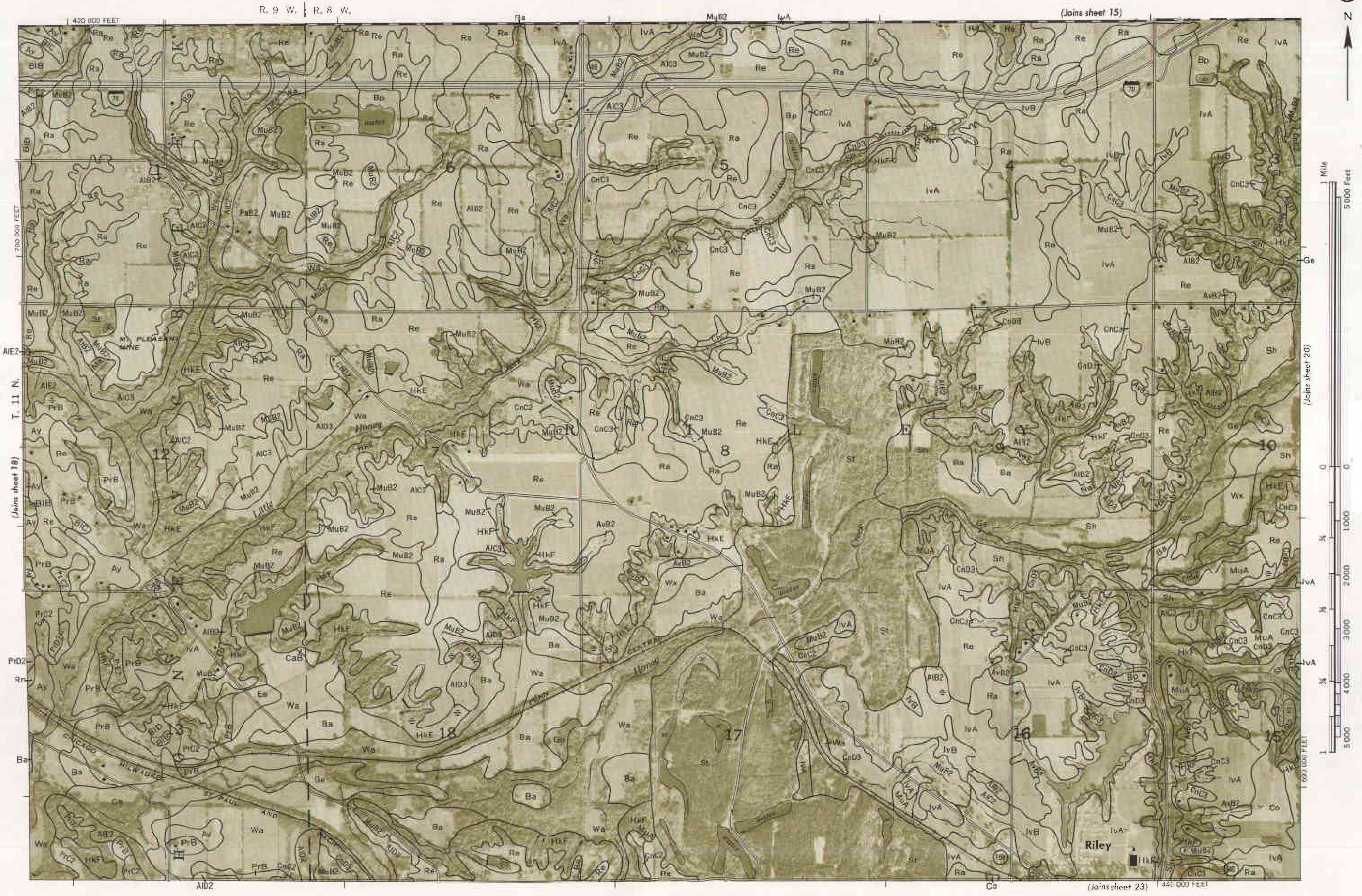
Land division corners are approximately positioned on this map.

VIGO COUNTY, INDIANA — SHEET NUMBER 18



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.

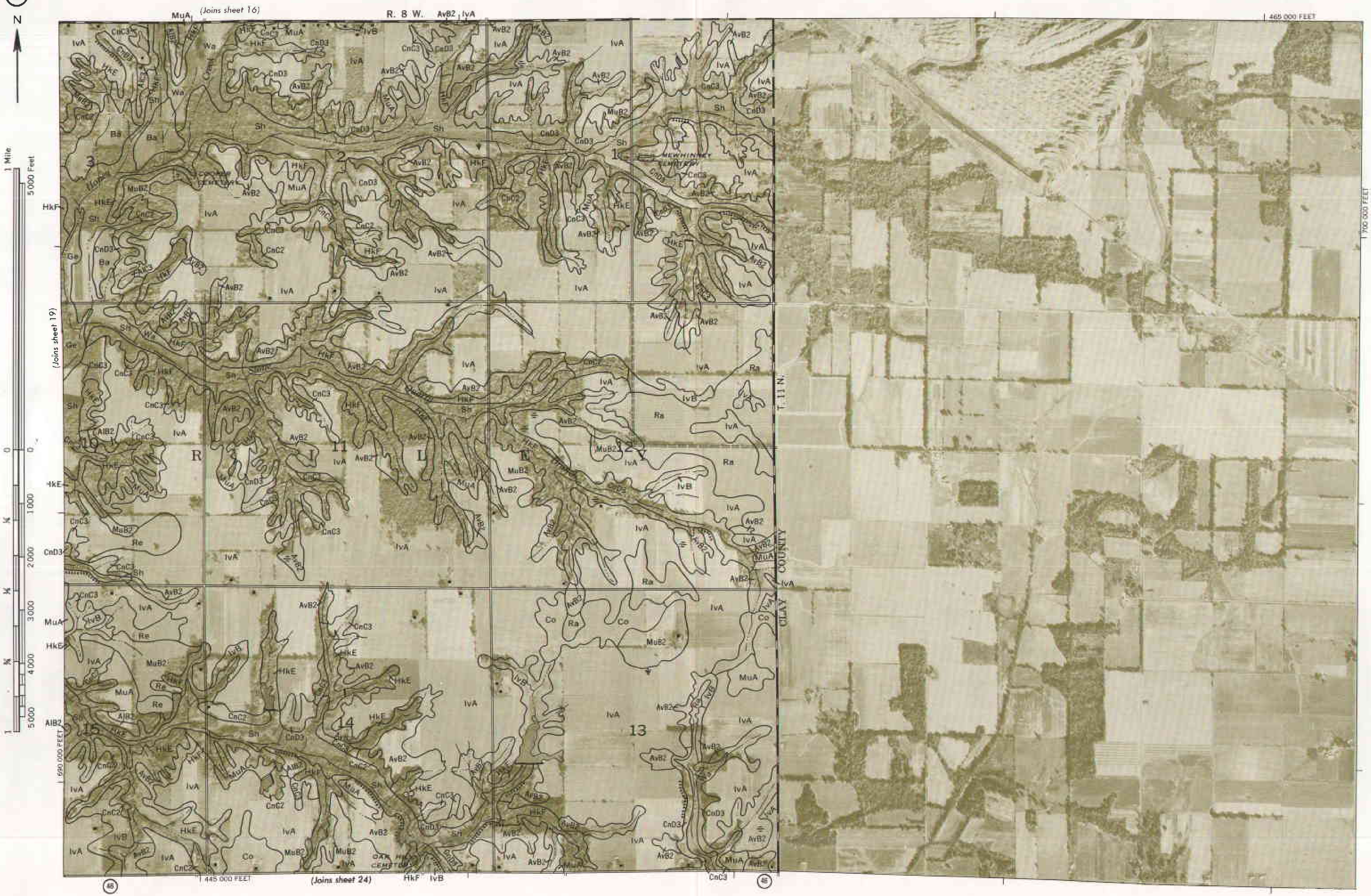
VIGO COUNTY, INDIANA NO. 18



VIGO COUNTY, INDIANA NO. 19

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station. Photobase from 1970 aerial photographs. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone. Land division corners are approximately positioned on this map.

VIGO COUNTY, INDIANA — SHEET NUMBER 20



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.

VIGO COUNTY, INDIANA NO. 20

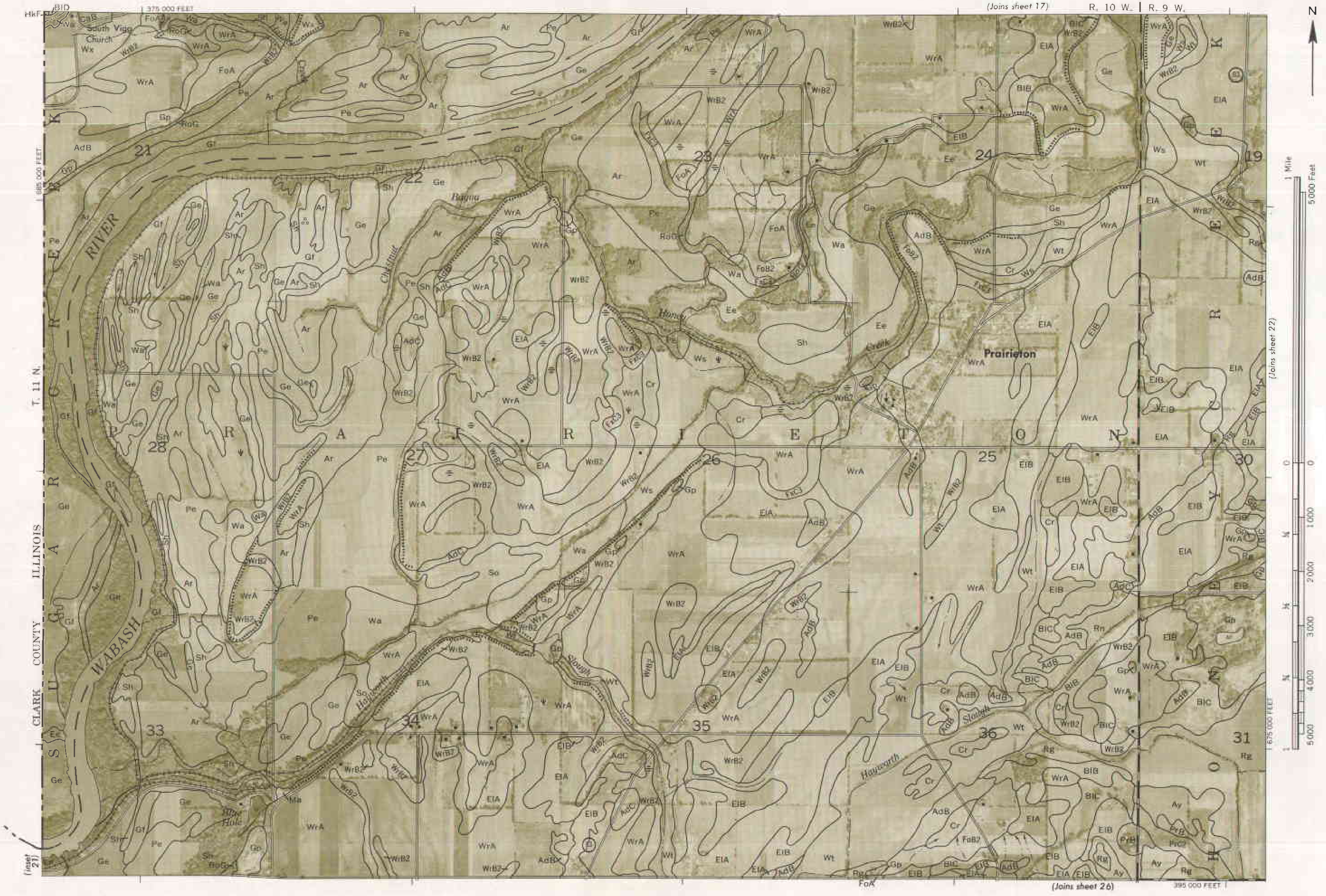
VIGO COUNTY, INDIANA — SHEET NUMBER 21

VIGO COUNTY, INDIANA NO. 21

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.

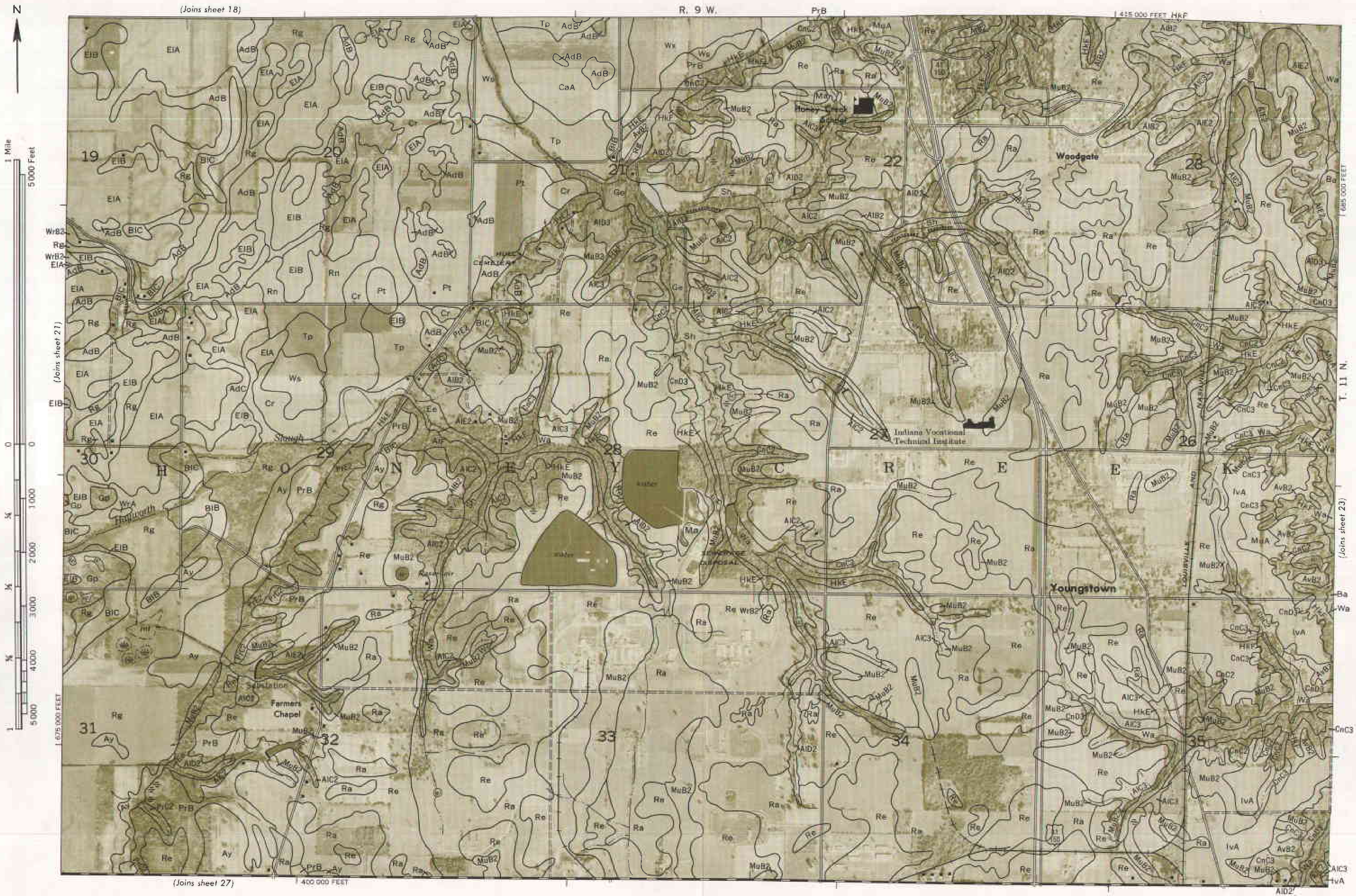
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.



㉒

VIGO COUNTY, INDIANA — SHEET NUMBER 22



Land division corners are approximately positioned on this map.

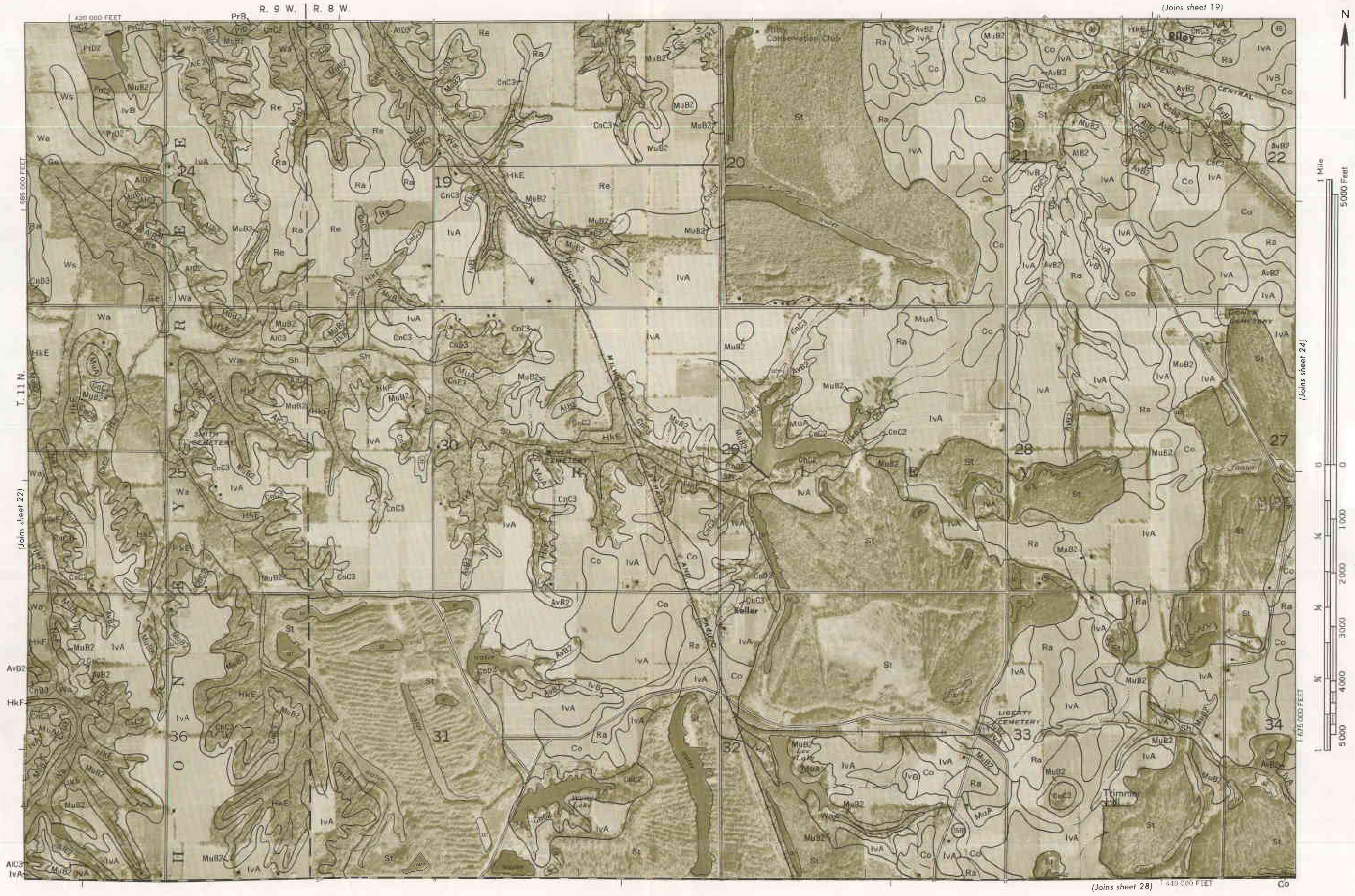
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

VIGO COUNTY, INDIANA NO. 22

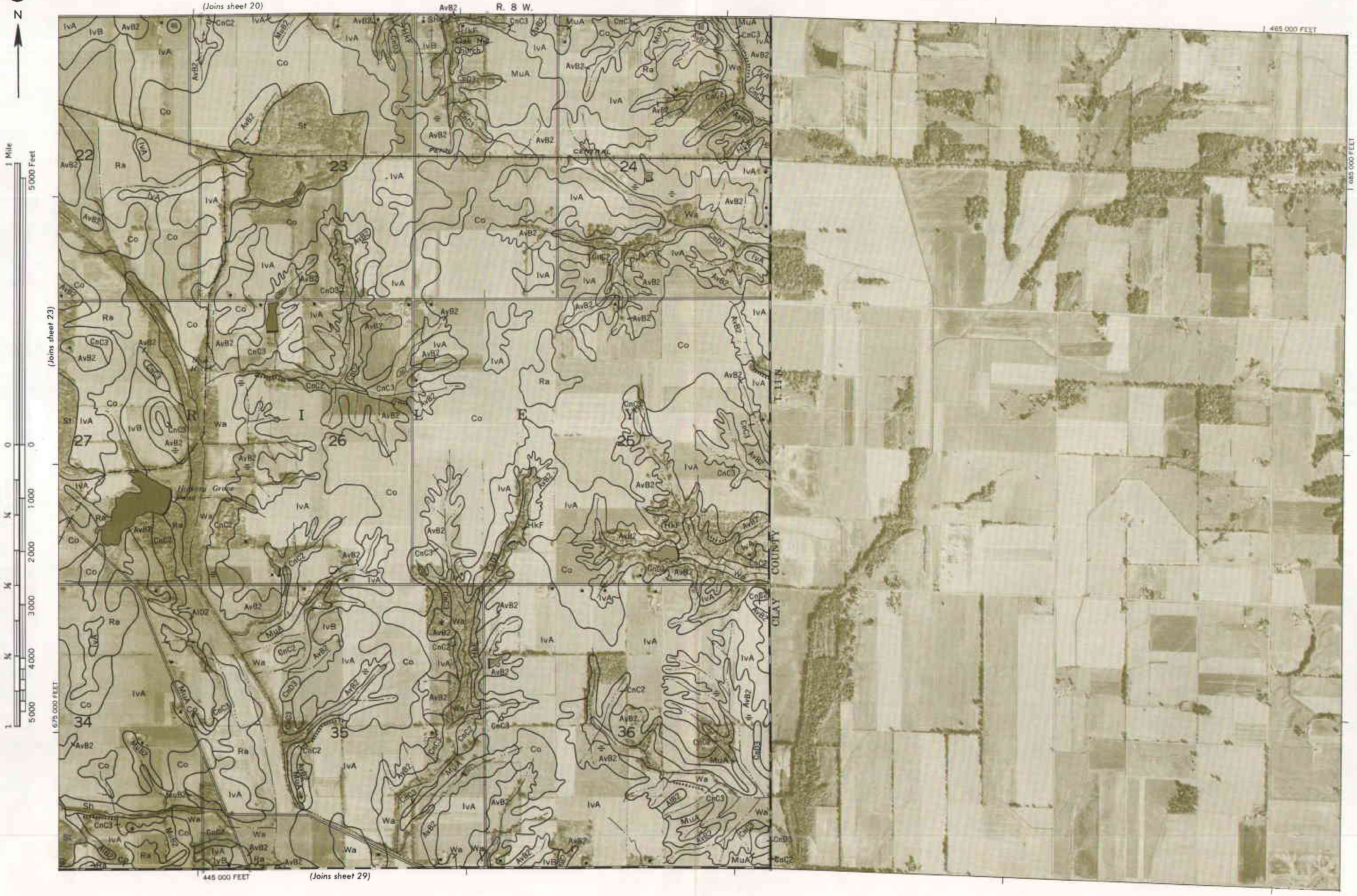
VIGO COUNTY, INDIANA NO. 23

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station. Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone. Land division corners are approximately positioned on this map.



㉔

VIGO COUNTY, INDIANA — SHEET NUMBER 24



Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

VIGO COUNTY, INDIANA NO. 24

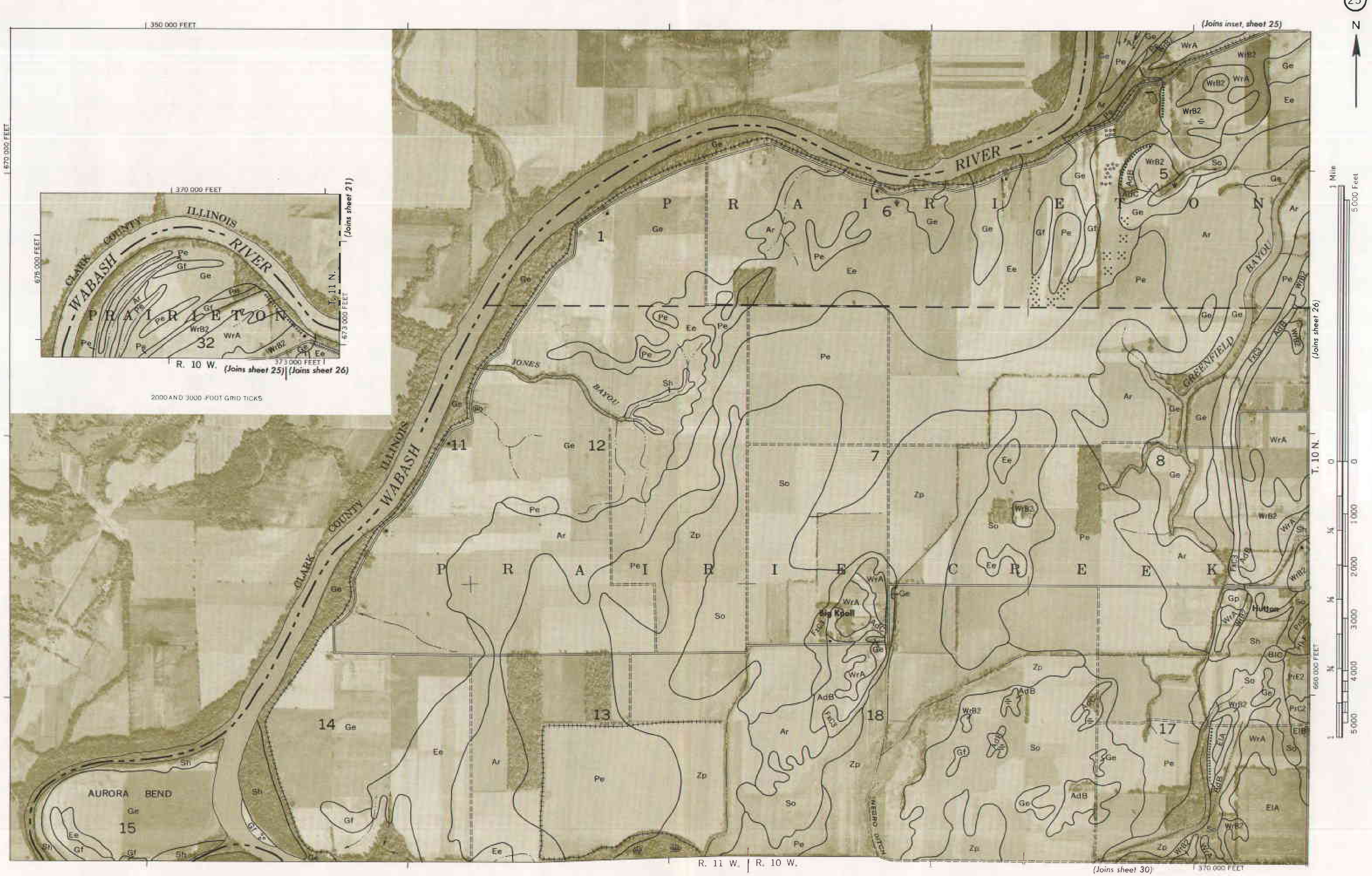
VIGO COUNTY, INDIANA — SHEET NUMBER 25

VIGO COUNTY, INDIANA NO. 25

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

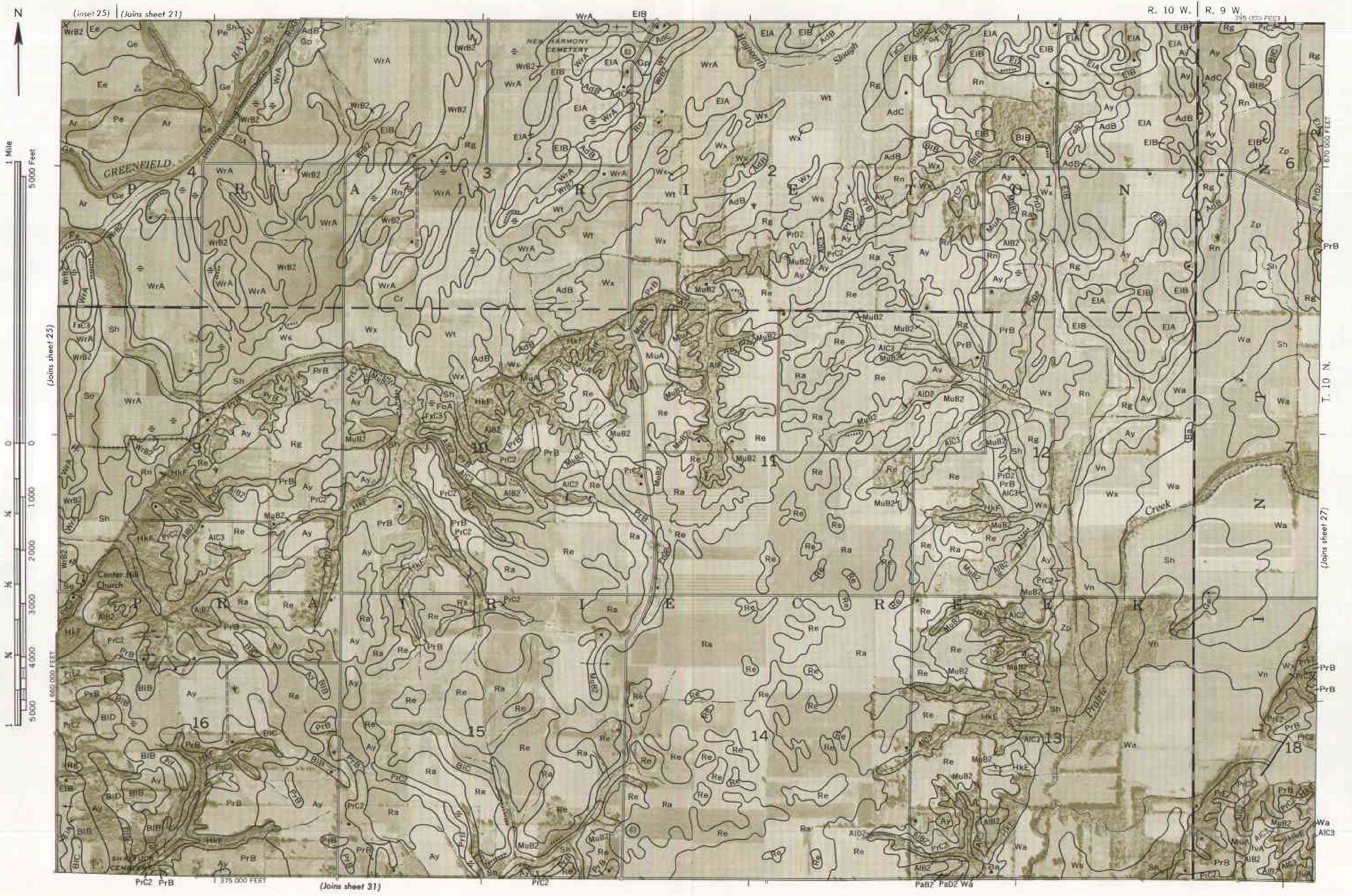
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.



㉖

VIGO COUNTY, INDIANA — SHEET NUMBER 26

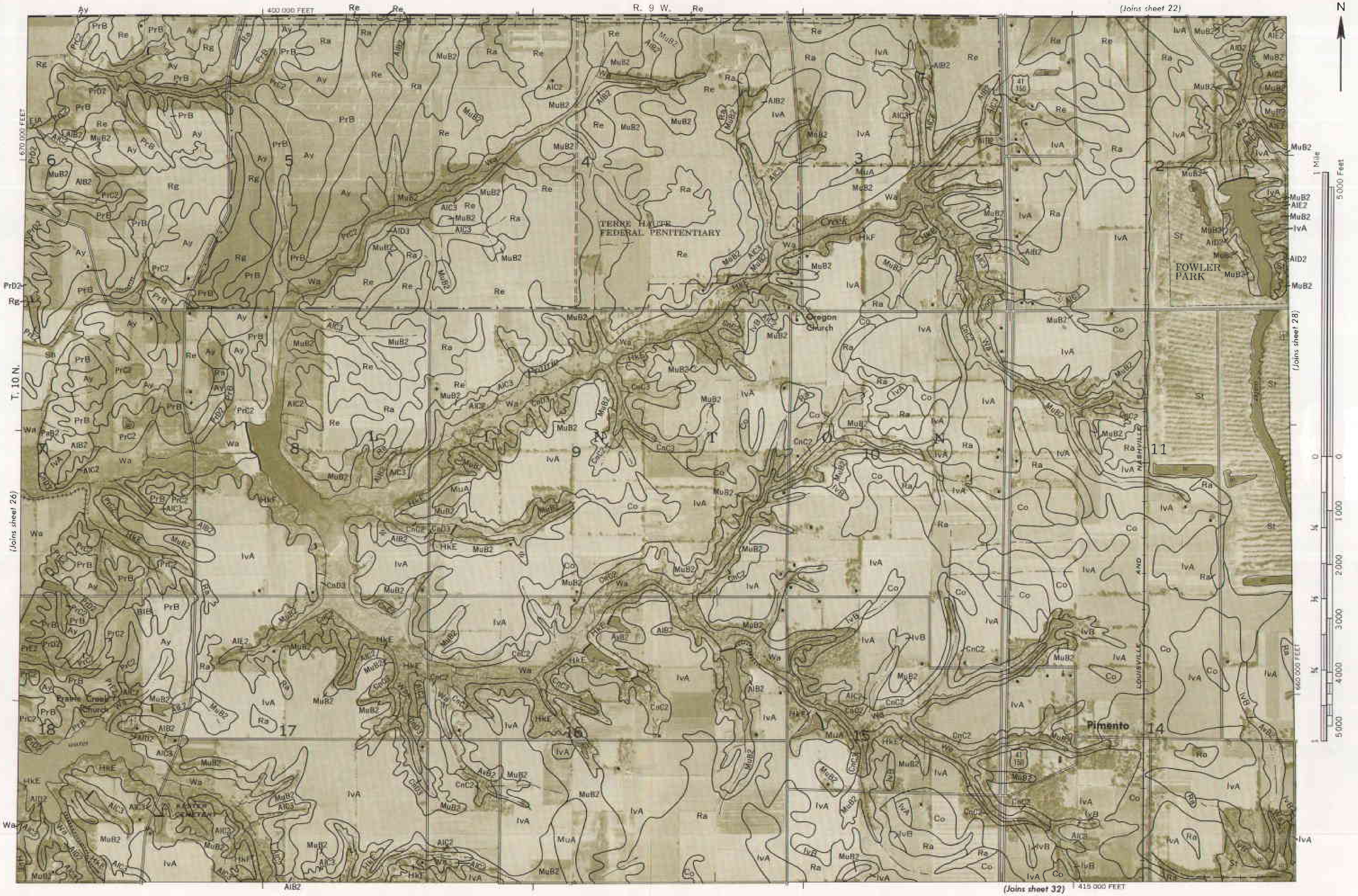


Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

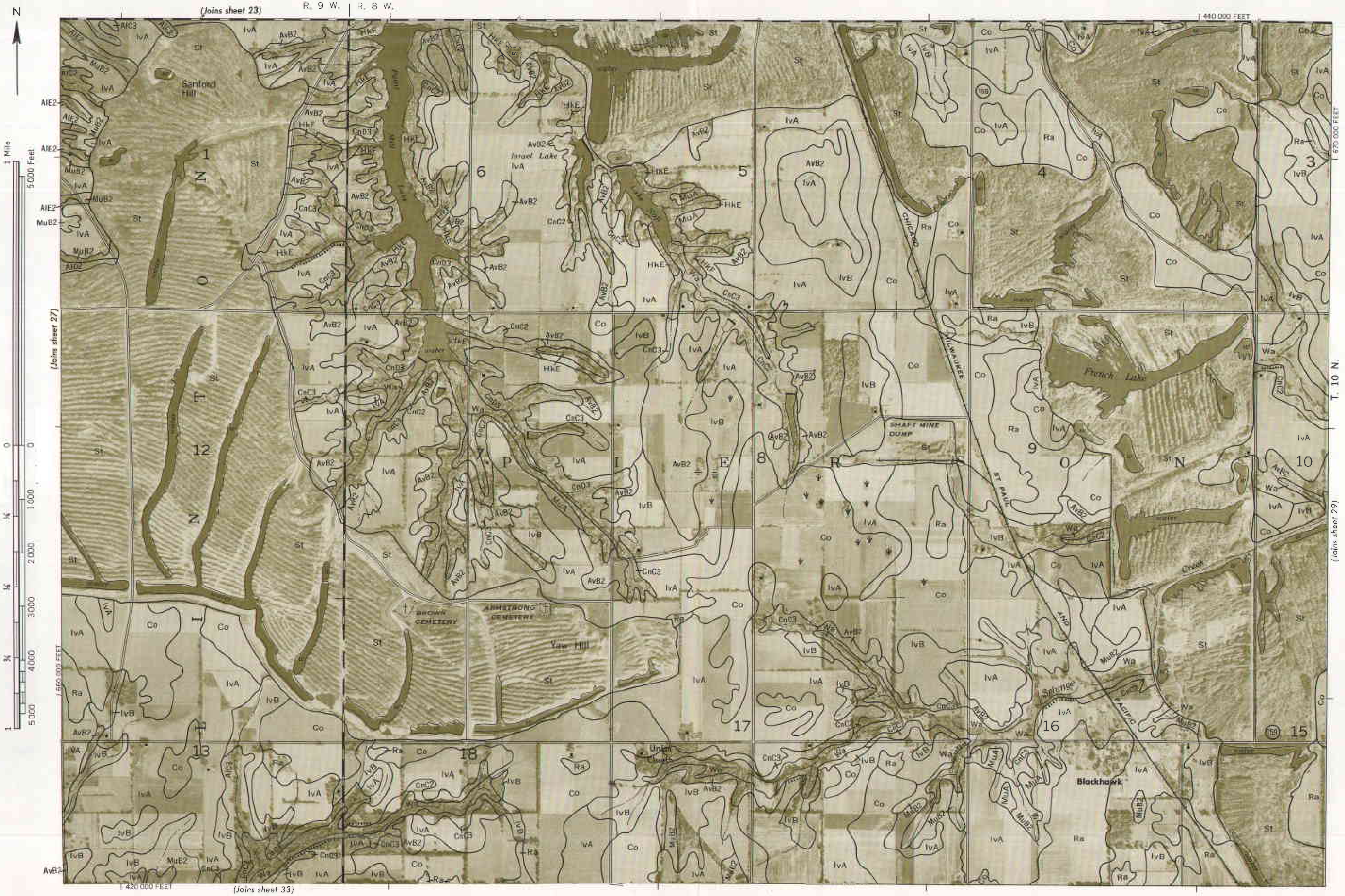
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

VIGO COUNTY, INDIANA NO. 26



VIGO COUNTY, INDIANA NO. 27
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.
Land division corners are approximately positioned on this map.

VIGO COUNTY, INDIANA — SHEET NUMBER 28



Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

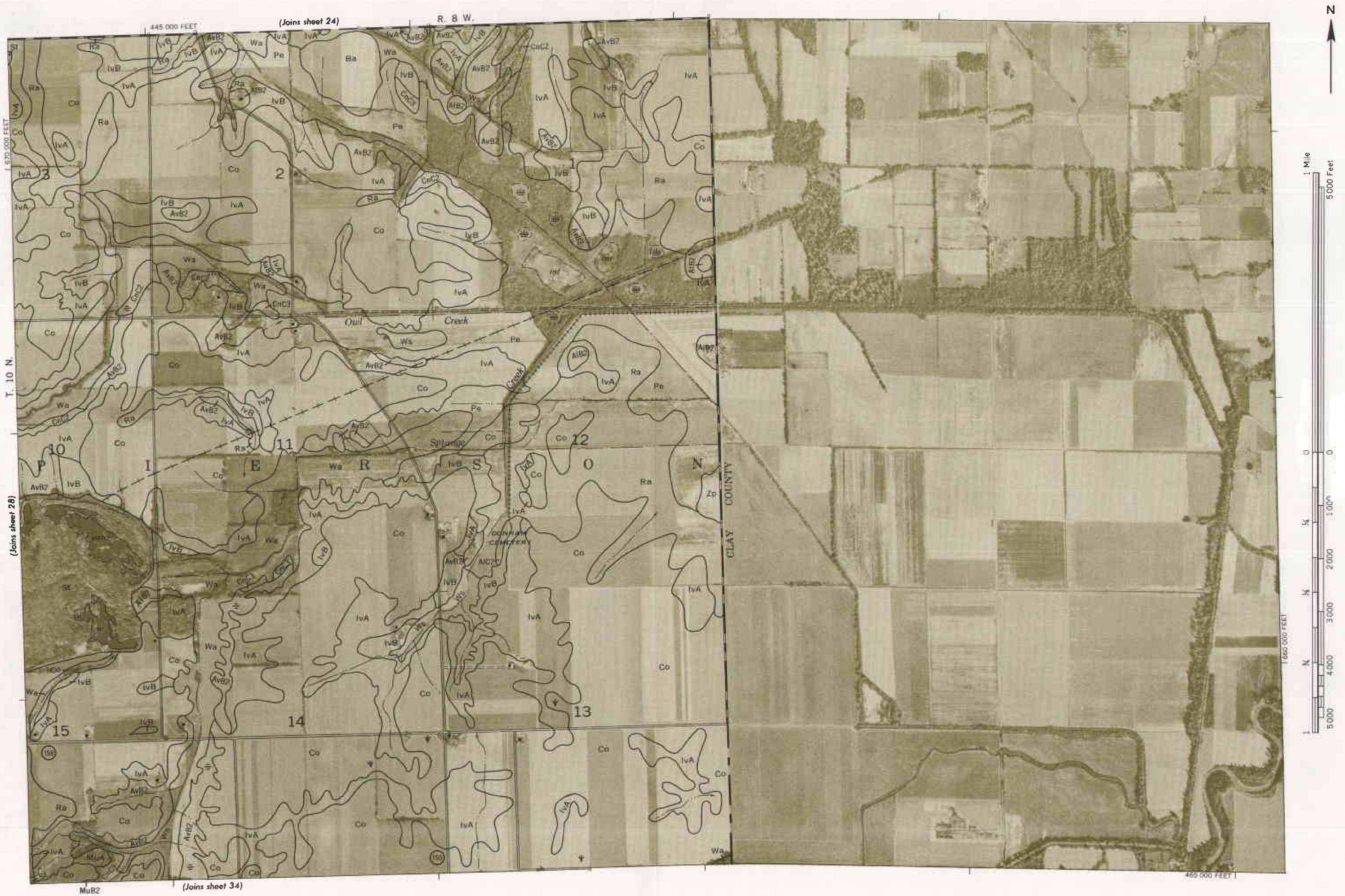
VIGO COUNTY, INDIANA NO. 28

VIGO COUNTY, INDIANA NO. 29

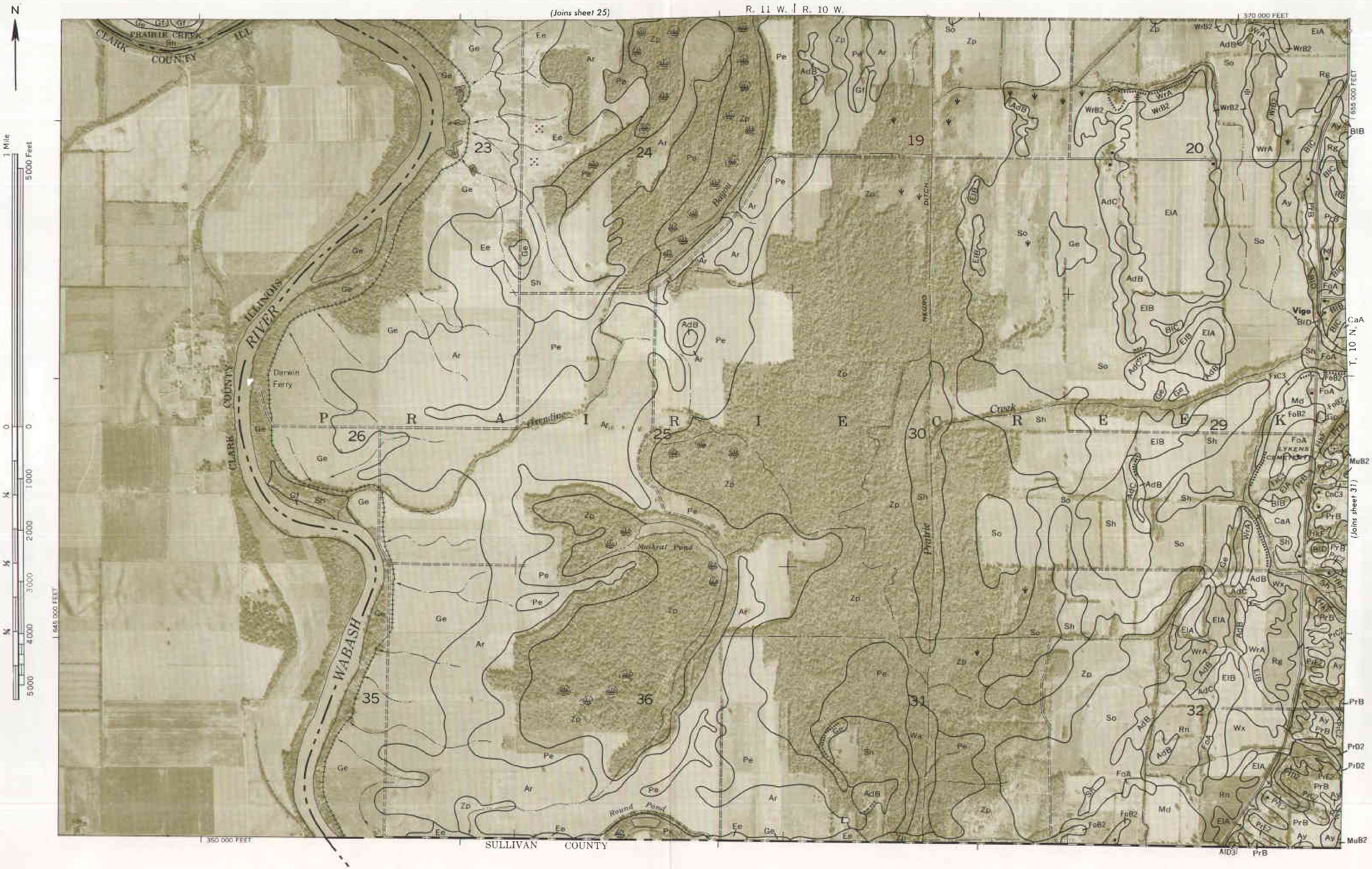
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.



VIGO COUNTY, INDIANA — SHEET NUMBER 30



Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

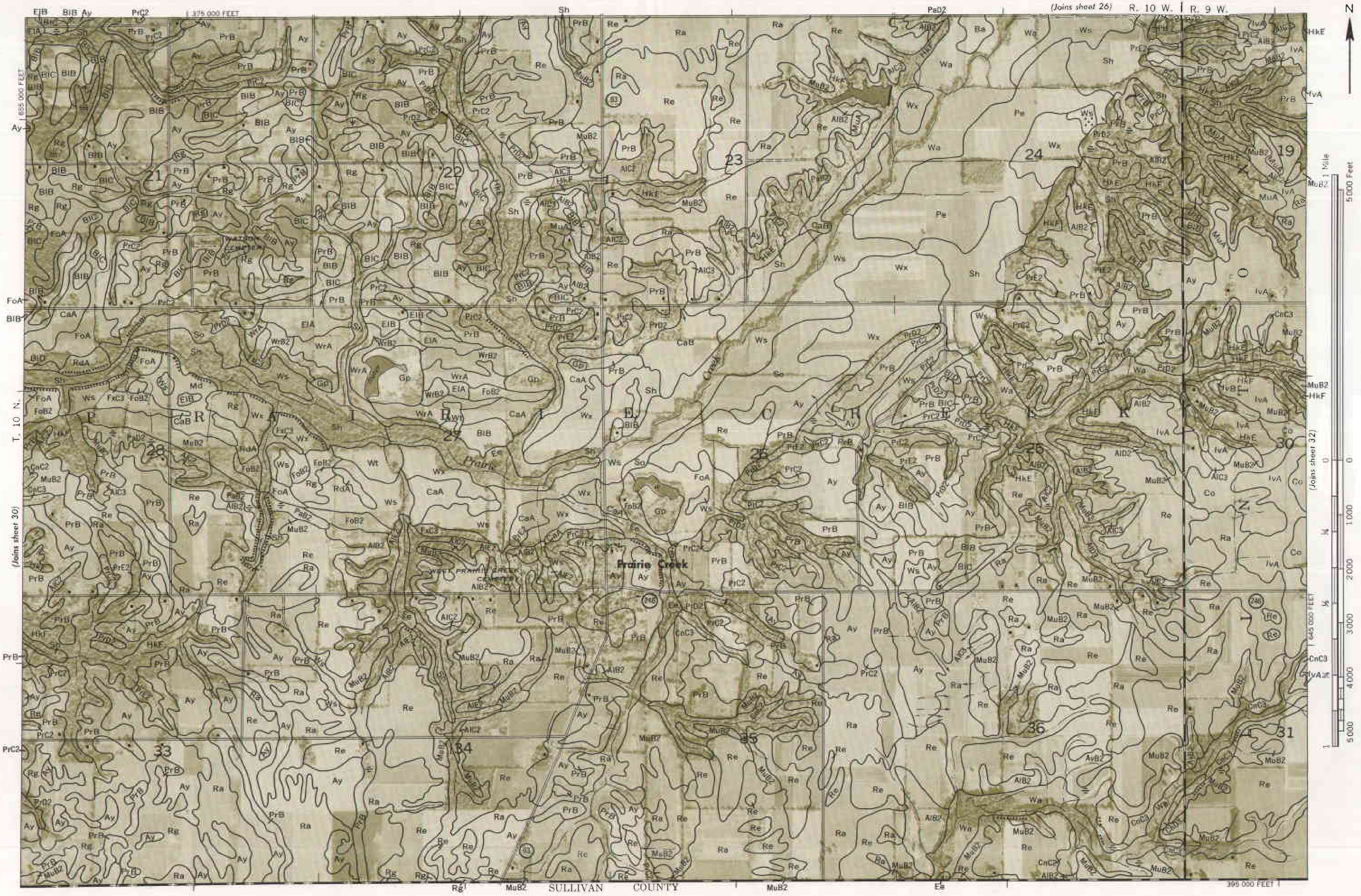
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

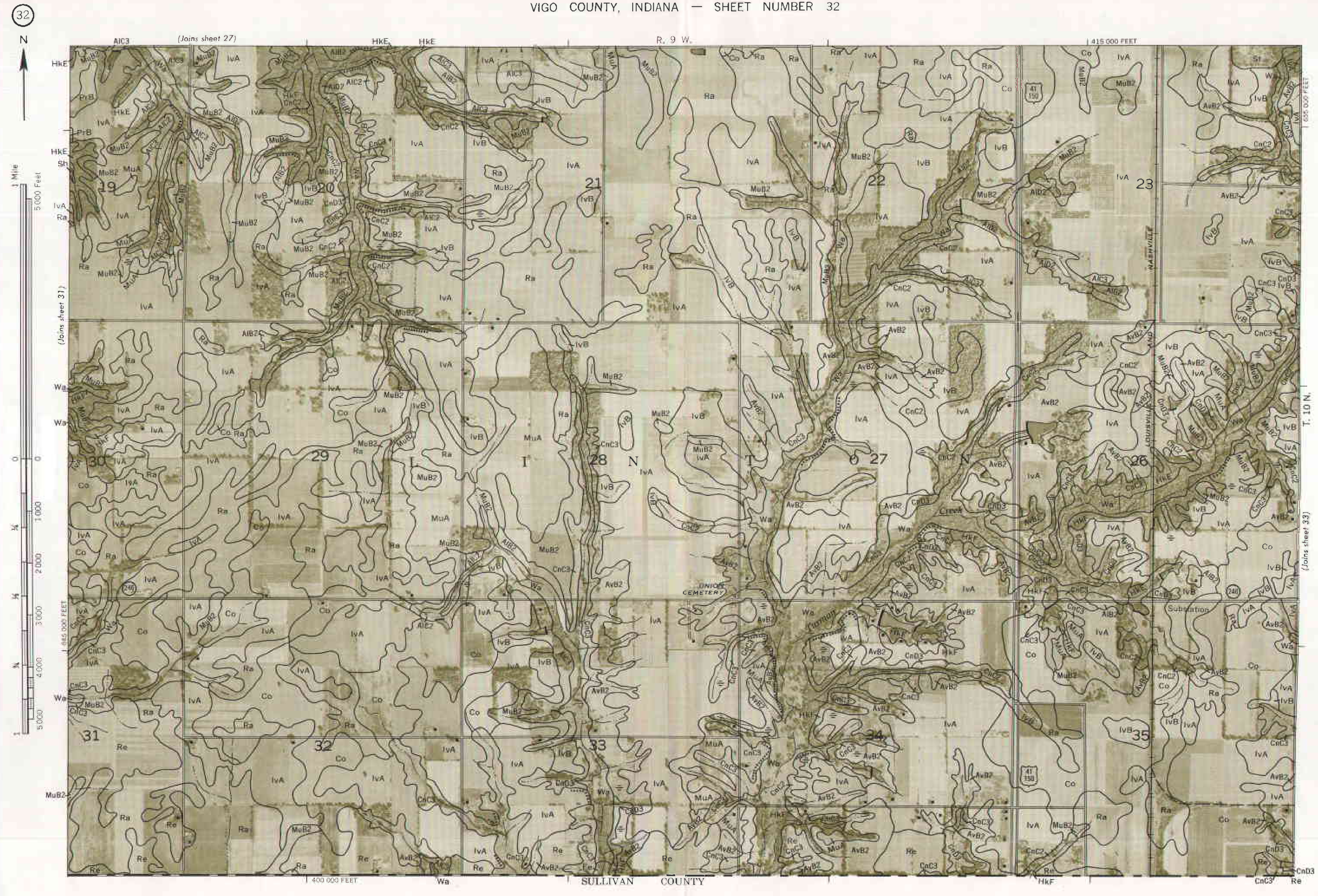
VIGO COUNTY, INDIANA NO. 31

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.





Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.

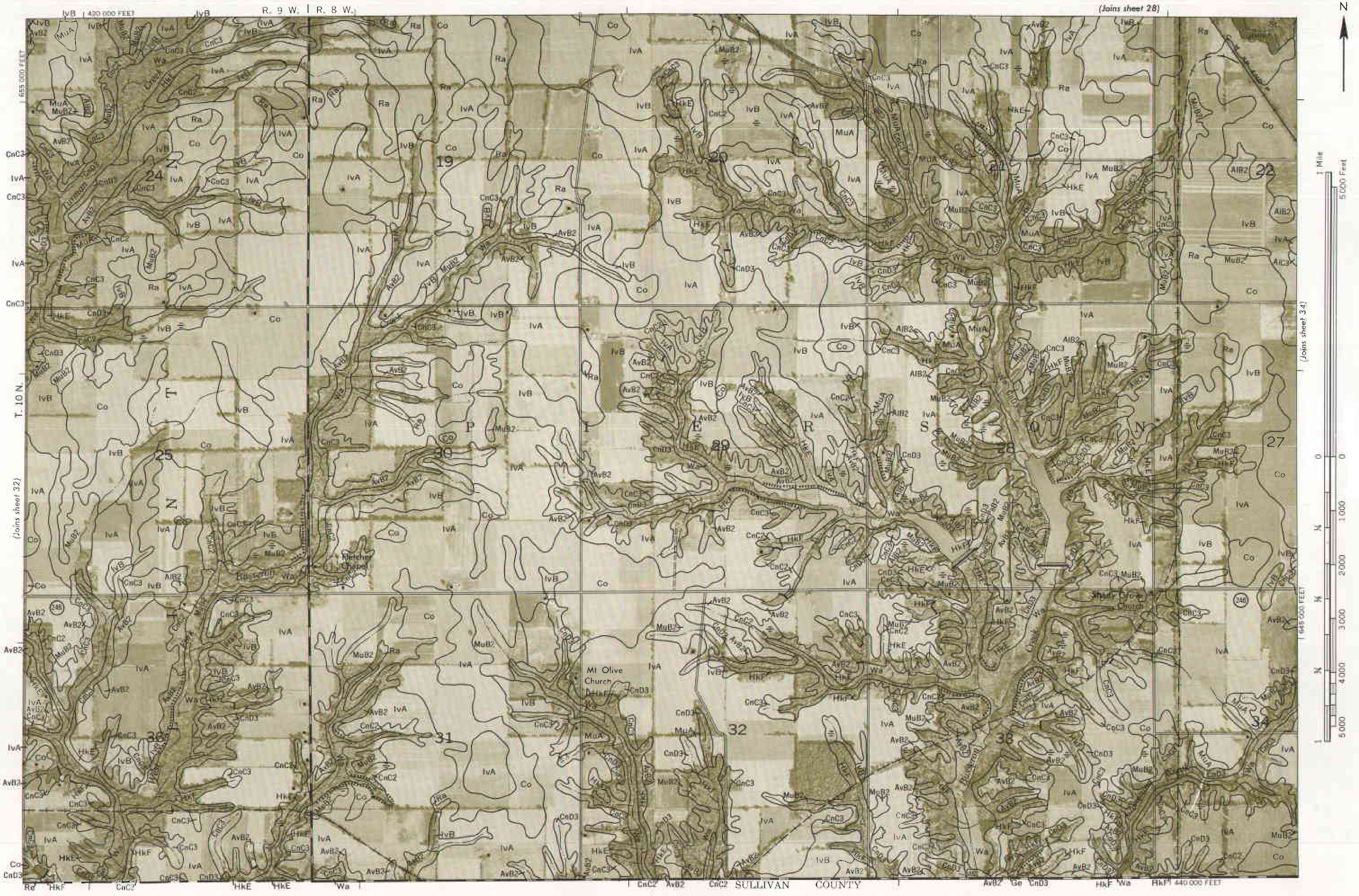
VIGO COUNTY, INDIANA NO. 32

VIGO COUNTY, INDIANA NO. 33

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Purdue University Agricultural Experiment Station.

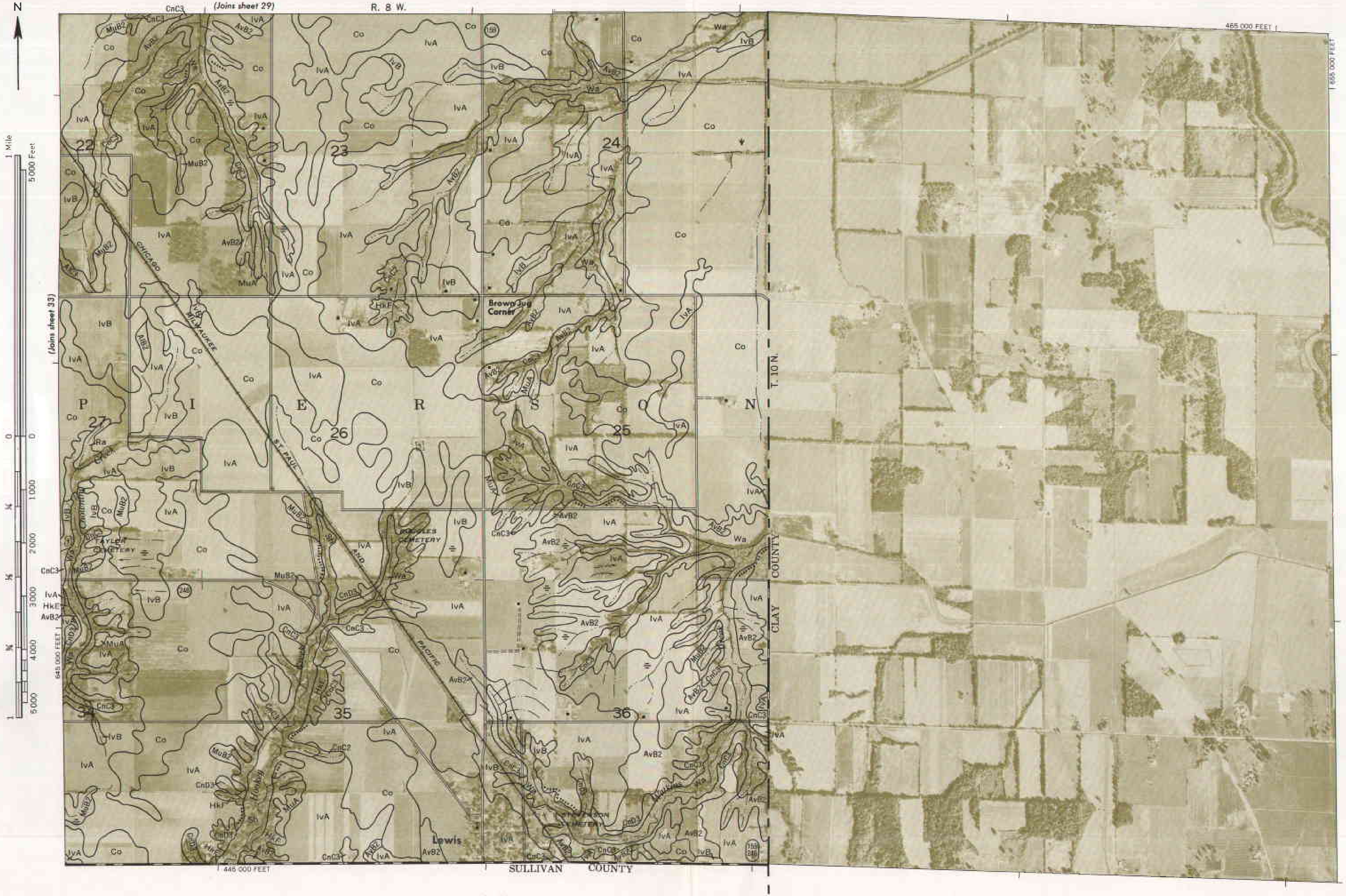
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

Land division corners are approximately positioned on this map.



㉞

VIGO COUNTY, INDIANA — SHEET NUMBER 34



Land division corners are approximately positioned on this map.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, west zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

VIGO COUNTY, INDIANA NO. 34